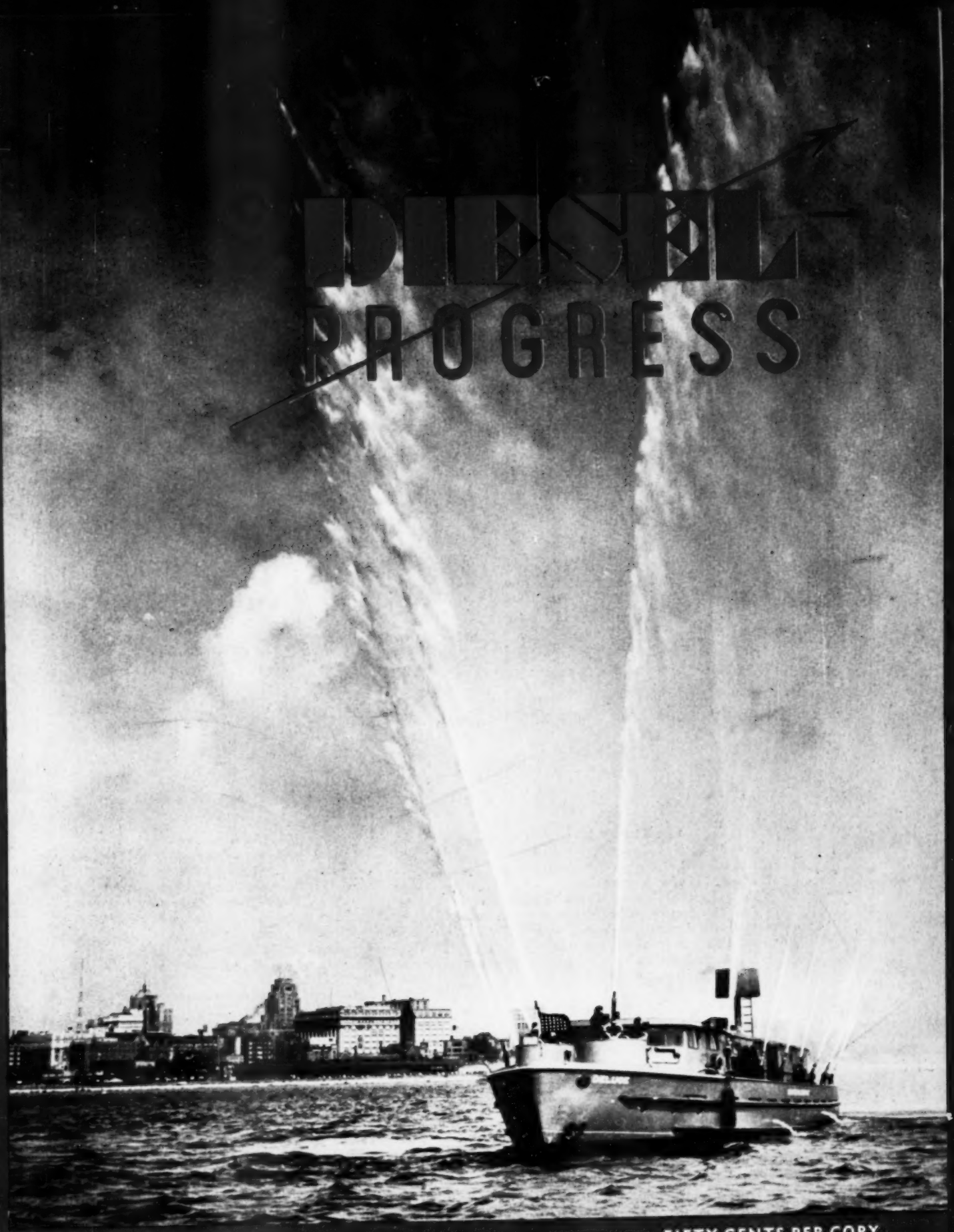
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



FIVE DOLLARS PER YEAR

OCTOBER, 1949

FIFTY CENTS PER COPY

IN 14 YEARS NO STUCK RINGS*

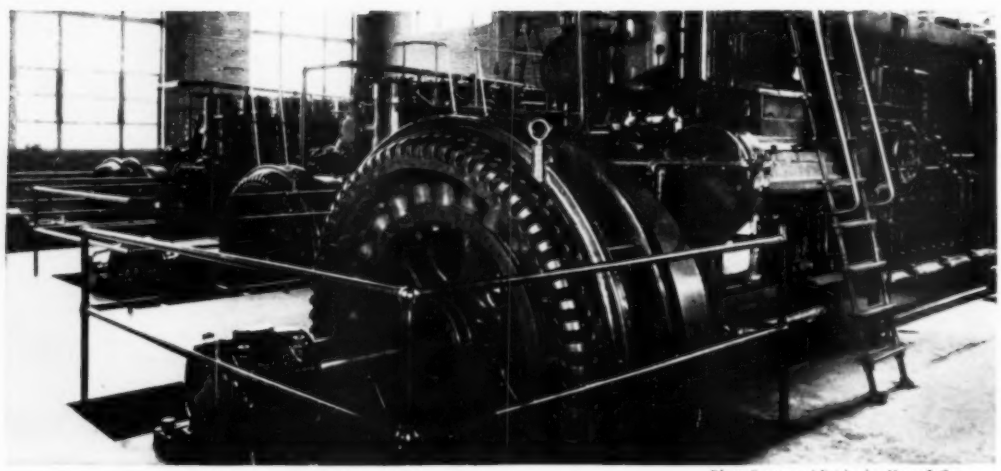


Photo Courtesy of Fairbanks, Morse & Co.

Diesels lubricated with Texaco stay clean—cost less to operate

THE case illustrated is typical. Operators everywhere find that *Texaco Ursa Oils* give them year-in-year-out high Diesel efficiency... lower maintenance costs ... reduction in fuel consumption.

Texaco Ursa Oils are especially made for Diesel lubrication. That means superior resistance to oxidation ... ability to stand up under high temperatures ... freedom from carbon, sludge and varnish. *Texaco Ursa Oils* assure better compression and combustion ... longer life for bearings, pistons, rings and cylinder liners.

There is a complete line of *Texaco Ursa Oils.* Leading Diesel engine manufacturers approve them, and—

More stationary Diesel hp. in the U. S. is lubricated with Texaco Ursa Oils than with any other brand.

Boost the operating efficiency and economy of your Diesels. A Texaco Lubrication Engineer will gladly help you. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

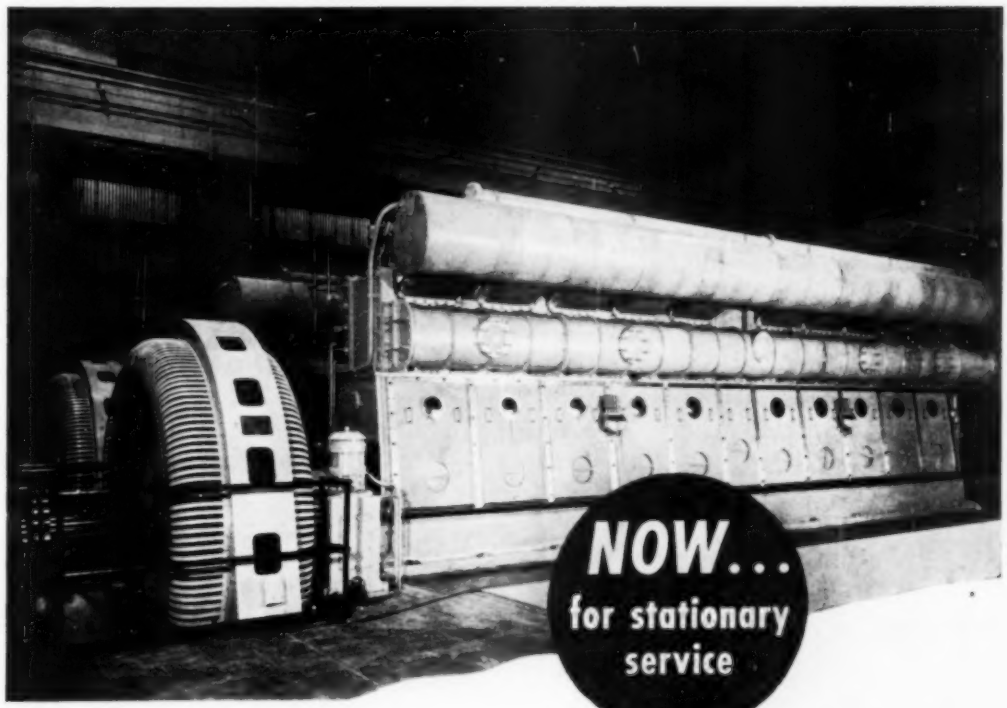
**Name of this Texaco user on request*

TEXACO

TEXACO Ursa Oils

FOR ALL DIESEL ENGINES

DIESEL PROGRESS, for October, 1949. Volume XV, Number 10. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 W. Forty-fifth St., New York 19, N. Y. Rex W. Wadman, President. Subscription rates: $5 per year, single copy 50c. Acceptance under 34.64, P. L. & R., at East Stroudsburg, Pa.



38% more horsepower per cylinder

from the Hamilton 21½" x 27½"

These are the principal changes that have been incorporated during the last year in the Hamilton 21½" x 27½":

Rotary Exhaust Valves

Rotary valves in the exhaust outlets, which close while intake ports are closing, entrap a larger volume of air, at slightly higher than atmospheric pressure. Total increase in air at full load—available for burning more fuel—is approximately 40%.

Larger Clearance Volume

By enlarging the combustion chamber and changing the shape of piston and head, better scavenging results and no increase in compression pressures even with the greater volume of air.

Intercooling of Scavenging Air

A scavenging-air cooler is installed between the blower and intake ports. This lowers the temperature of the entire cycle, permits development of more horsepower without increase in temperatures.

Automatic Air Control

Also, an automatic scavenging-air-volume control is provided to reduce flow at partial loads. This assures quiet, clean, performance and has been a major factor in the good efficiency of this engine at reduced loads.

The Hamilton Series 21-SA diesel, a 2-cycle engine with 21½-inch bore and 27½-inch stroke, has been redesigned in the last year so that it is now rated for 60-cycle generating sets, at 520 hp per cylinder, 277 rpm. This is the *net* power developed at 100% load—the power available at the shaft after allowing for blower requirements.

This rating represents a 38% increase in horsepower. It has been achieved with no increase in compression or firing pressures, and practically no increase in temperature. B.m.e.p. is held to the very conservative value of 74.5 lb per sq. in. Speed is well within the limits of good practice. Fuel guarantee is low—and is practically the same for all loads between 50% and 100%—which, we believe, gives this engine the lowest guaranteed fuel rate, for average loads, of any diesel in its horsepower range.

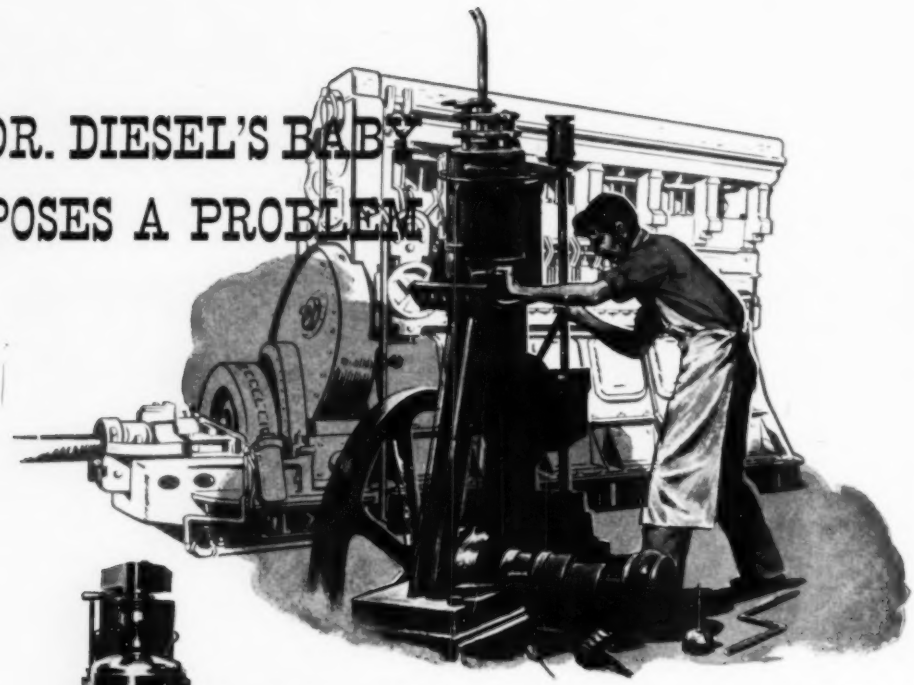
If you are considering a diesel in the 2600-hp range and up, we would be pleased to give you full information on this engine. Call the Lima-Hamilton sales office in New York or Chicago, or write directly to Lima-Hamilton, Hamilton, Ohio.

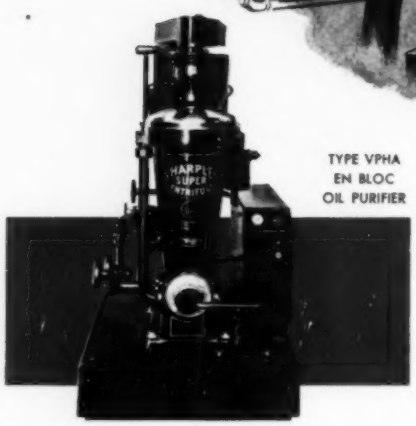
LIMA HAMILTON CORPORATION

DIVISIONS: Hamilton, Ohio—Hooven, Owens, Rentschler Company; Niles Tool Works Company. Lima, Ohio—Lima Locomotive Works Division; Lima Shovel and Crane Division.

PRINCIPAL PRODUCTS: Hamilton diesel and steam engines; Hamilton heavy metal stamping presses; Hamilton-Kruse automatic can-making machinery; Niles heavy machine tools; Special heavy machinery; Heavy iron castings; Weldments; Locomotives; Cranes and shovels.

DR. DIESEL'S BABY POSES A PROBLEM





TYPE VPHA
EN BLOC
OIL PURIFIER

Specify Sharples Oil Purifiers for more efficient Diesel and turbine operation

Write for Bulletin No. A1250 which gives full descriptions of all Sharples Centrifugal Oil Purifiers as well as details concerning their use and specifications.

The high heat and pressure generated in modern Diesel engines contribute to efficient operation. But this heat and pressure also cause a lubrication problem. Oil splashing up under the cylinders, tends to form relatively heavy carbon deposits which then work loose and become suspended in the lubricating oil.

If this carbon in suspension is not removed it combines with water to form sludge and loose carbon circulating through the system is an abrasive which damages bearing and cylinder surfaces.

And there's another thing to consider. Modern lubricating oils contain detergents and additives which protect engine metals against corrosion and oxidation . . . improve the efficiency of the oil. While filtering will remove the carbon it may also filter out some of these important protective elements.

When you install Sharples Oil Purifiers in your Diesel lubrication system, however, you assure the removal of water, carbon and sludge but additives and detergents remain in the oil to provide extra engine protection.

Another important reason for specifying Sharples Oil Purifiers is that the bowl may be removed, cleaned and replaced in less than 15 MINUTES. This means big savings in time, labor and operating costs.

● *Sharples Engineers will be glad to cooperate with you in solving any problem in the purification of fuel or lubricating oils.*

SHARPLES *The Sharples Corporation*

New York 17, N. Y. 521 Fifth Avenue
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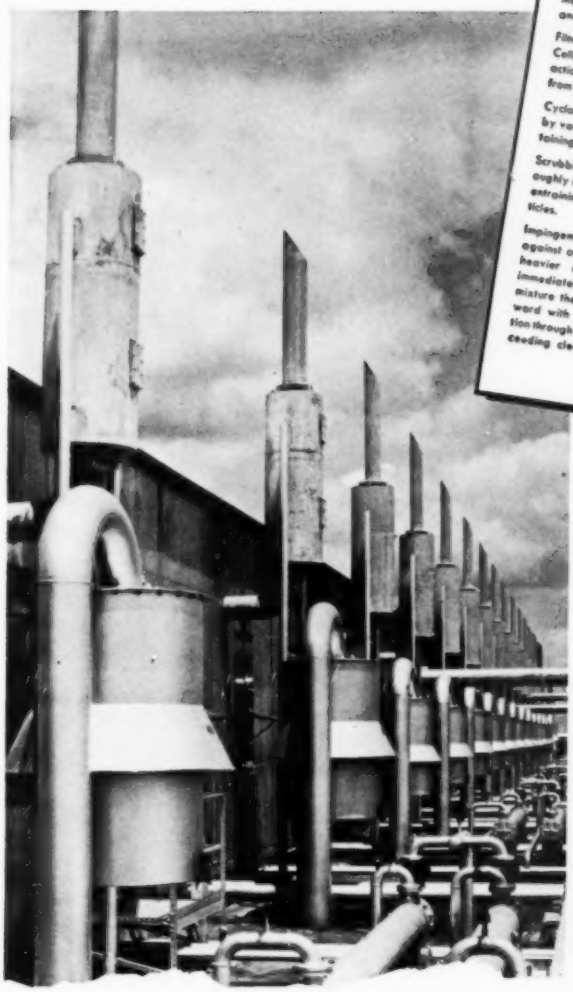
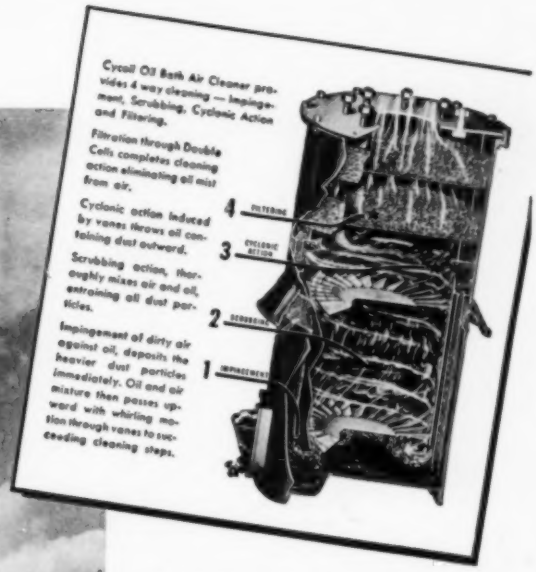
San Francisco 5, Cal. 686 Howard Street
Cleveland 15, Ohio 453 Hippodrome Annex Bldg.

EXECUTIVE OFFICES AND FACTORY, 2300 WESTMORELAND ST., PHILADELPHIA 40, PA.

CYCOILS gobble up trouble

before it starts




Cycoil Oil Bath Air Cleaner provides 4 way cleaning — Impingement, Scrubbing, Cyclonic Action and Filtering.
Filtration through Double Cells completes cleaning action eliminating oil mist from air.
Cyclonic action induced by vanes throws oil containing dust outward.
Scrubbing action, thoroughly mixes air and oil, entraining all dust particles.
Impingement of dirty air against oil, deposits the heavier dust particles immediately. Oil and air mixture then passes upward with whirling motion through vanes to succeeding cleaning steps.
4
3
2
1

ENGINE troubles resulting from dust-laden intake air are both real and costly. But they will never be a threat at this Oklahoma refinery. Each of the 16 Cooper-Bessemer compressors, representing a total of 10,400 HP, is on a strict diet of dust-free air supplied by a Cycoil* Oil Bath Cleaner.

Cycoil doesn't compromise with dust. Over 90% of the total fine dust content of the air is trapped by the oil bath action of the Cycoil even before reaching the filter pads. Positive oil circulation for continuing self-cleaning action, plus the additional filtration to be had in the filter pads, assures approximately 100% clean air.

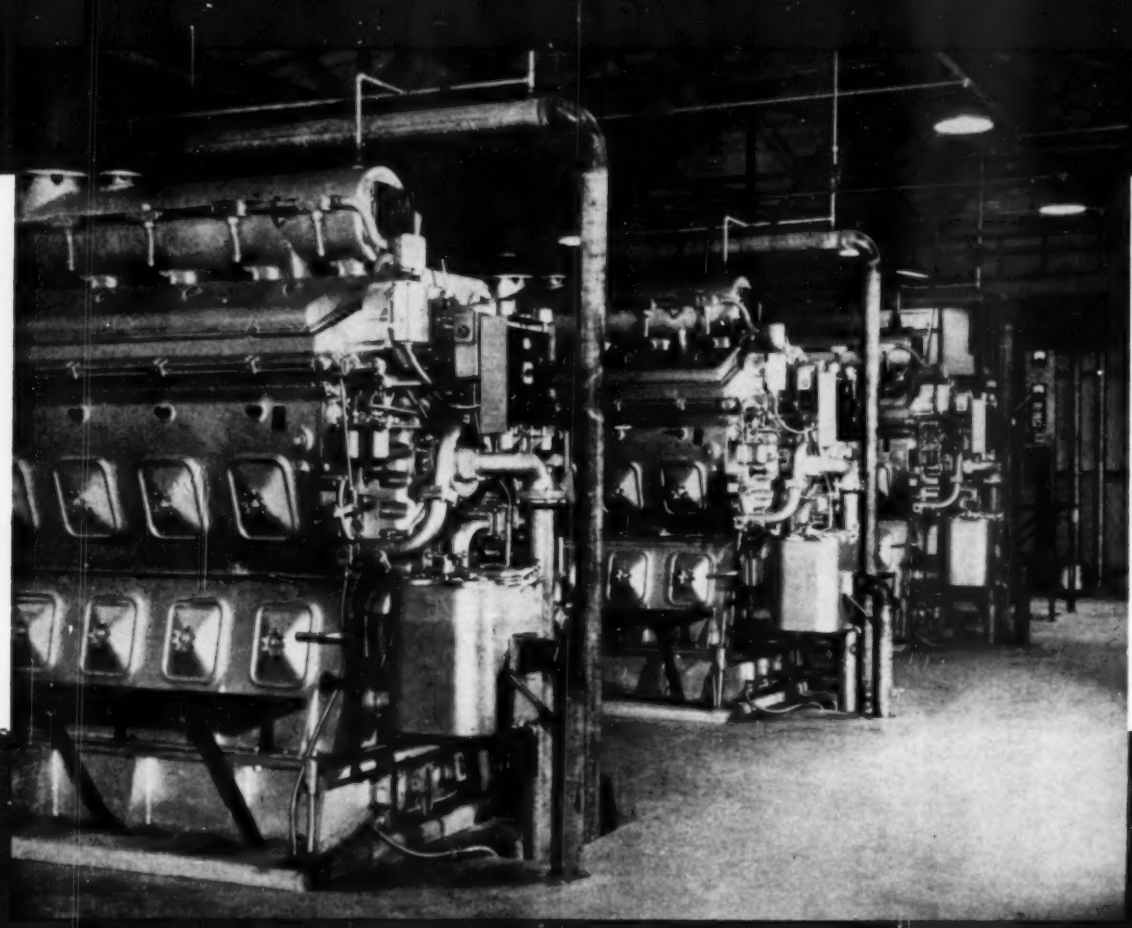
Thousands of engines and compressors are today guarded by Cycoils. Their freedom from dust damage over the years gives proof of this oil bath air cleaner's effectiveness. Complete information on Cycoil's positive protection is contained in Bulletin 130-D. Write for it now.

AMERICAN AIR FILTER COMPANY, INC.
408 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd. Montreal, P. Q.

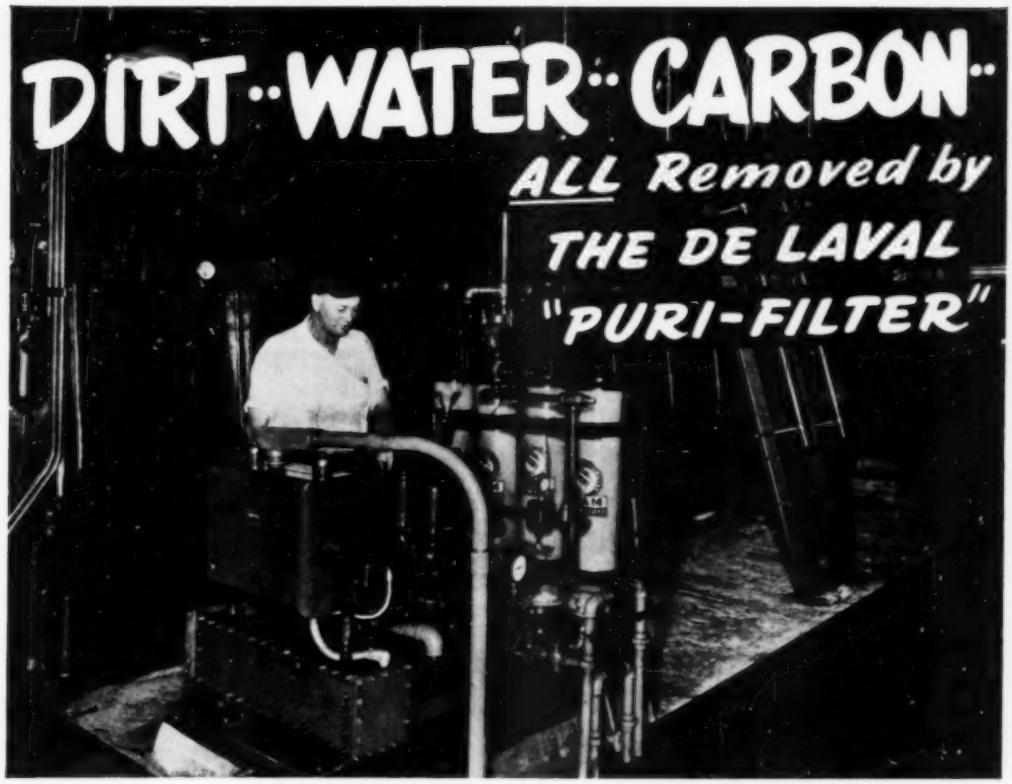
**Trade mark registered U. S. Patent Office*

AAF. **Cycoil OIL BATH AIR CLEANER**
AND INTAKE SILENCER

ONE OF SEVERAL HUNDRED POWER PLANT INSTALLATIONS
WITH ENGINES REGULATED BY
Marquette HYDRAULIC GOVERNORS



Marquette METAL PRODUCTS CO.
CLEVELAND 10, OHIO
SUBSIDIARY OF CURTISS-WRIGHT CORPORATION
Also Manufacturers of: ROLLER BEARING TEXTILE SPINDLES
WINDSHIELD WIPERS FOR AIRCRAFT, TRUCKS AND BUSES • FUEL OIL PUMPS
FUEL OIL INJECTORS • PRECISION PARTS AND ASSEMBLIES



THE De Laval "Puri-Filter" removes all major contaminants of Diesel lubricating oil: dirt, water and carbon. The first two are thrown out of the oil by centrifugal force applied in the bowl of the De Laval Oil Purifier—the water being discharged continuously. The colloidal carbon is then filtered out of the purified oil by the Fram filters.

Analyses of oil samples taken from many "Puri-Filters" now in service show that practically all of the material that causes gums, sludges, "cokes," etc., is eliminated by the combined effects of centrifuging and filtration. Elimination of this material, normally in suspension even in detergent type oils, means less ring sticking . . . better engine performance . . . the utmost in protection.

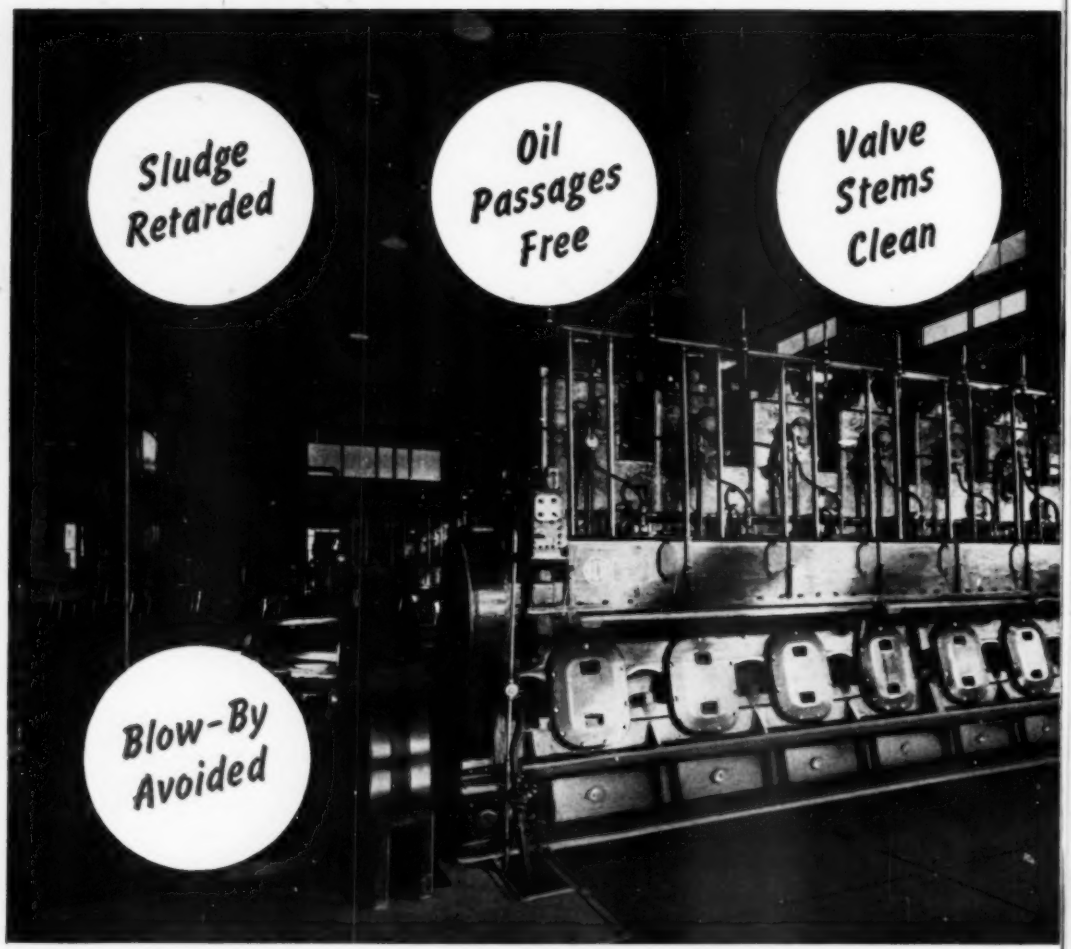
• ***Write for additional details.***

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL *Oil Purifiers*

FOR DIESEL LUBRICATING OIL

SINCLAIR Beats The Dirty



SINCLAIR

YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE

GASCON Engine Problem

Diesel engineers know that engines fouled with sludge and varnish do not produce full power . . . and require frequent maintenance service.

When Sinclair GASCON is the lubricant, sludge and varnish worries are relieved. Engines are kept clean with GASCON. Its natural solvent properties retard the formation of deposits and accumulation of sludge. By protecting against sluggish valve action and keeping piston rings free to provide positive seal, full power output can be attained while maintenance is kept at a minimum level. Try Sinclair GASCON.

This Pilot Plant, part of the great Sinclair Research Laboratory at Harvey, Ill., provides space for six miniature operating replicas of commercial-sized refinery units. Continuous research explains the high quality of GASCON and other Sinclair Oils.

Making a study of crystal structure of catalysts, this Sinclair researcher at Harvey uses physical chemistry to develop refinery techniques in a never ending effort to bring industry better petroleum products at lower costs.

INDUSTRIAL OILS

FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.

The Socony-Vacuum Oil Company, Inc., tugboat "Socony 23" recently converted from steam to GM Diesel power at the Wills-Speden Shipyard, Inc., Baltimore, Md.

"Socony 23" *has switched* to GM Diesel Power

AS part of their current program, Socony-Vacuum Oil Company, Inc., has just repowered the "Socony 23" with a 1200 H.P. General Motors Model 12-278A Diesel engine. Originally a steam-driven tug, the "Socony 23" now has twice as much power and can tow a fully loaded 17,500-barrel oil barge at the rate of 7½ mph. Again, repowering with GM Diesel power is proving more economical, more powerful, more reliable—for it's the power plant that pays its way!

Leader in Diesel engineering development for 37 years

CLEVELAND DIESEL ENGINE DIVISION
CLEVELAND 11, OHIO
GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

ENGINES FROM 150 TO 2000 H.P.

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San Francisco 5, Calif.

International Diesel power units operating this Georgia portable sawmill depend on Purolator Oil Filters

Sawdust in oil is a bad diet for engines...

Flying sawdust is *bound* to hit the oil stream in any sawmill operation. The problem is to filter it out *completely* before it clogs up oil lines, accelerates formation of sludge, cuts down essential lubrication of vital engine parts.

On this type of job . . . and under other rugged, dirty operating conditions . . . the solution is a Purolator Micronic oil filter.

Purolator's exclusive micronic element traps particles measured in microns (.000039 of an inch) . . . and has a revolutionary accordion-pleated design which provides a filtering area 5 times that of old-style oil filters.

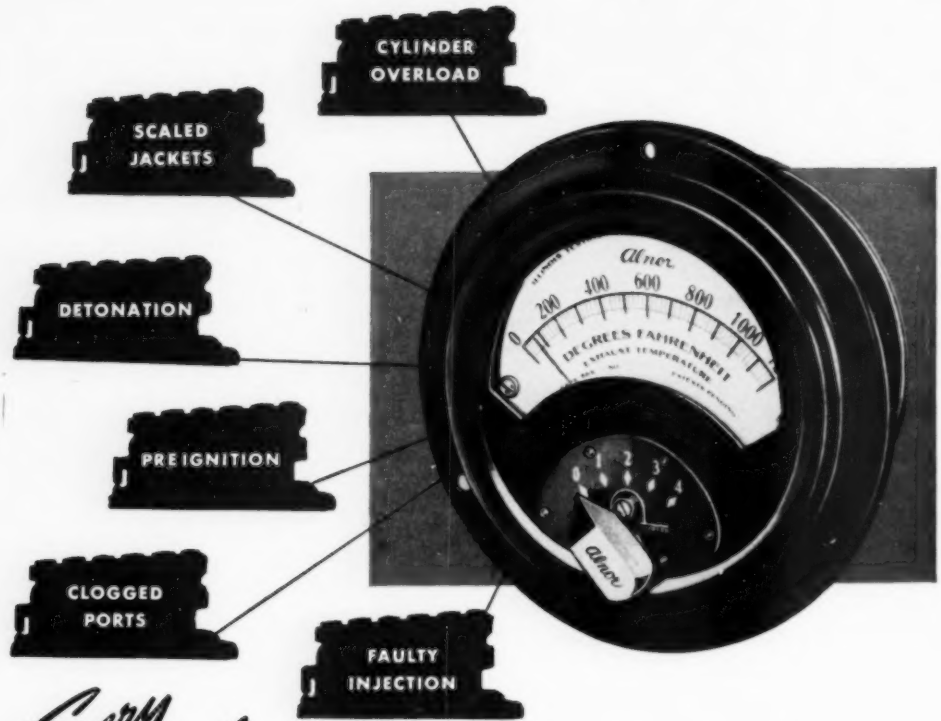
For *fuel* oil filtration . . . this means the *complete* job so vital because of close tolerances of injector plungers, and the microscopic size of injector tip orifices. And for *lube* oil filtration . . . Purolator's greater efficiency assures less wear on hard-working bearings and other parts.

Write for details—and consult our highly experienced engineering staff about your *special* filtering problem.

PUROLATOR PRODUCTS INC.
Newark 2, New Jersey; and Windsor, Ontario, Canada

Protect your Power with Purolator!

PUROLATOR
MICRONIC OIL FILTER



Every Diesel deserves **Alnor protection**

Send for Catalog!

For complete information on the line of Alnor exhaust pyrometers available to you, send for bulletin 4361 which contains the whole story.

Illinois Testing Laboratories, Inc.
Room 508, 420 N. LaSalle Street, Chicago 10, Ill.

☐ Send Bulletin 4361
☐ Have Alnor Representative call.

Name .....
Firm name .....
Address .....
City ..... *Zone* ..... *State* .....

Why does practically every major diesel engine manufacturer provide Alnor exhaust pyrometers as original equipment? Because Alnor exhaust pyrometers provide the user with the simplest, lowest cost means of anticipating trouble and breakdowns before they start, of reducing maintenance expenses to a bare minimum, of assuring maximum efficiency and long-lived operation. Exhaust temperature readings give any diesel operator the complete story of engine operation, cylinder by cylinder. Careful readings when new engines are being installed and adjusted mean getting off to the right start: consistent twice-a-day readings throughout the life of the engine can prevent costly wear and expensive failures—to more than pay for the installation of Alnor exhaust pyrometers. If your diesel engines are not equipped with these instruments, chances are that they should be.

Illinois Testing Laboratories, Inc.
420 N. LaSalle Street, Chicago 10, Illinois

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

DIESELS FOR TOUGH JOBS

Allis-Chalmers HD-19
Torque Converter Tractor
removing heavy shale.

DELCO-REMY FOR DIESELS

Diesels and tough jobs go well together.

Diesels and Delco-Remy are an equally popular combination with users and manufacturers alike.

This popularity results from Delco-Remy's years of cooperation with Diesel manufacturers—designing and building specialized equipment to meet advancements in the industry.

UNITED SERVICE MOTORS

DELCO-REMY—A UNITED MOTORS LINE
Service Parts and Delco Batteries
Available Everywhere, Through
UNITED MOTORS DISTRIBUTORS

Delco-Remy
DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN

*VISCOSITY

All equipment will last longer — give better service — if you use the proper lubricant. That's why you'll find it profitable to use Tycol high quality oils and greases.

There's a reason! No matter what your lubrication need — for roll neck bearings or mine cars, Diesels or high speed textile spindles, turbines, paper calenders or steam engines . . . where *VISCOSITY, penetration, extreme pressure is a factor — Tycol has a lubricant suited to your specific requirements.

Refined from selected crudes, Tycol lubricants are exceptionally resistant to breakdown which means greater economy . . . longer life for every type of equipment.

Let us show you the extra value in every measure of Tycol lubricants. Write your nearest Tide Water Associated office today.

TYCOL

INDUSTRIAL LUBRICANTS

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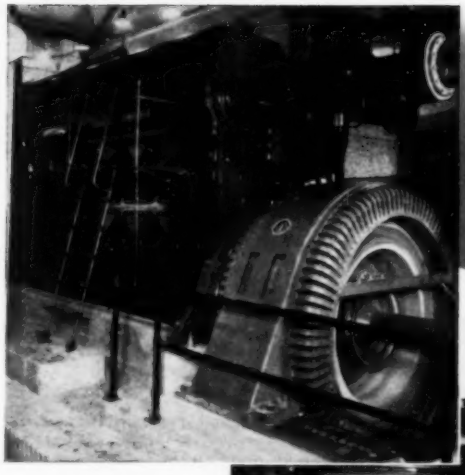
TIDE WATER ASSOCIATED OIL COMPANY

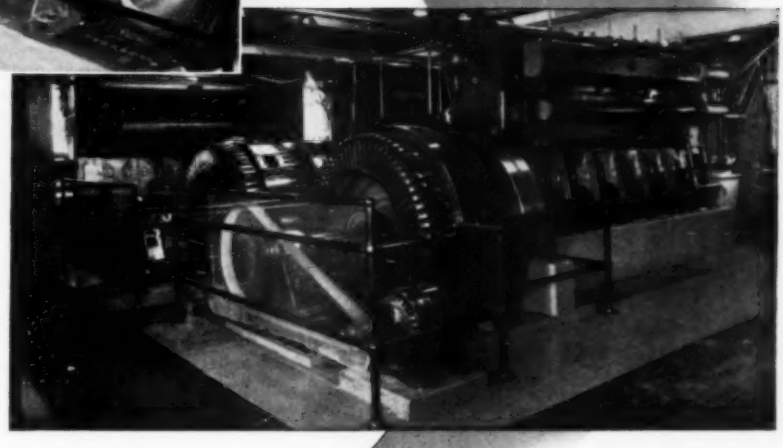
17 BATTERY PLACE - NEW YORK 4, N. Y.

*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA" This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL



Gold is where you find it



● Seven Superior Diesels helped a midwest quarry company find gold—gold in the form of reduced power costs. In only 12 years the use of Diesels reduced the cost of electrical power $156,000, *after all expenses, including depreciation, were deducted!*

But Superior Diesels supplied more than a low cost source of power—they also provided a dependable one. The engines are operated *at least 16 hours daily, 6 days a week, 52 weeks a year!*

Over and over again we hear similar reports about the outstanding performance provided by Superior Diesels. But that's not strange when you consider that Superior has all of the following advantages: Conservative Ratings ● Fuel Economy ● Precision Bearings ● Heavy Rigid Crankshafts ● Strong Bases and Cylinder Blocks ● Proved Roller Chain Camshaft Drive ● Oil Cooled Pistons.

Superior Diesels may be able to help you get gold from your power costs. We would like to discuss it with you—just drop us a line and tell us when it's convenient for you.

THE NATIONAL SUPPLY COMPANY
SUPERIOR ENGINE DIVISION
Plant and General Sales Office: Springfield, Ohio

THE NATIONAL NSCO SUPPLY COMPANY

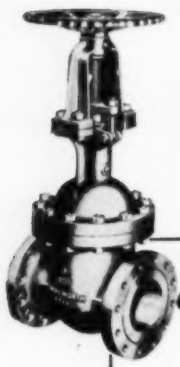
Superior DIESEL

WALWORTH

Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke



Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2" to 24") insure tightness and maximum packing life — costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion — they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated — not flange type. No recess exists at back of ring — hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Dirt-Proof

Your Fuel Oil and Lube Oil with AC Filter Elements

FOR FUEL FILTERS

Millions of hours of service stand behind the AC Quality Elements engineered for Diesel fuel filters. For their full life, these precision-built elements actually "Dirt-Proof" the fuel. As protection for fuel injectors and transfer pumps, AC Elements are unequalled. Yet their cost is little, if any, greater.

FOR LUBE OIL FILTERS

AC also builds a full line of elements for nearly every make of lubricating oil filter—elements so efficient that they "Dirt-Proof" lube oil. Each element is precisely engineered for the job it is to do, and the filter it is to fit. Each gives the longest protection consistent with maximum filtering efficiency.

Complete Filters and Strainers for both Fuel and Lube Oil

For the fuel system, AC Strainers and Filters are made to serve engines up to 500 hp.—intermittent or continuous operation.

For the lubrication system, AC Oil Filters are available for engines up to 1800 cubic inch displacement.

AC OIL FILTERS

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

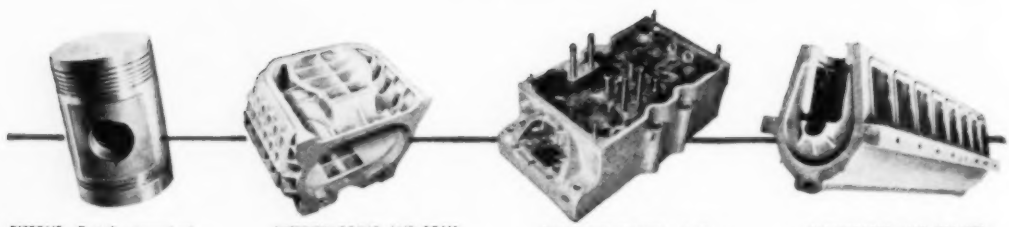
● Big steps toward increasing your diesel's availability can be bearings of Alcoa Aluminum. They **LOWER DIESEL MAINTENANCE** because they last longer.

Naturally corrosion resistant, aluminum bearings take condensate and acid oils in their stride. They're solid metal all the way through. Their one-piece construction eliminates bond failure that causes down time.

You're maintenance dollars ahead with aluminum bearings finished by leading bearing manufacturers from sound, high-quality Alcoa Castings. Your nearby Alcoa sales office can tell you which diesels use aluminum bearings. ALUMINUM COMPANY OF AMERICA, 2141K Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

S BETTER



PISTONS—Get the proved advantages you've enjoyed in Alcoa Aluminum Pistons, in these other diesel parts.

SUPERCHARGING AND SCAVENGING are more efficient through the use of aluminum. Here, too, diesels can save weight with Alcoa Aluminum.

CYLINDER HEADS of Alcoa Aluminum—better heat distribution allows increased engine ratings. Lighter weight, easier servicing.

CRANKCASES AND FRAMES—the lighter weight of crankcases and frames of Alcoa Aluminum gives your diesel a higher horsepower-weight ratio.

ALCO-G. E. FREIGHT LOCOMOTIVE
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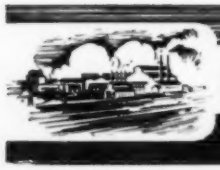

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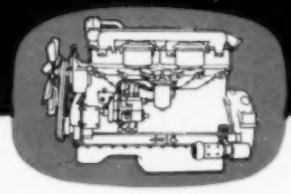
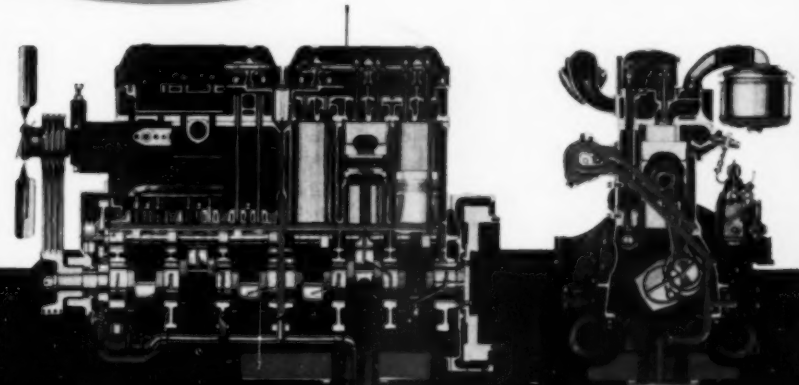
for automotive Diesel Engines



Hercules 6-cylinder Diesel engine, Series DFX.



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This ad is the fifth of a series featuring well known automotive Diesel engines. Illustrated above is the Hercules 6-Cylinder Diesel, Series DFX.

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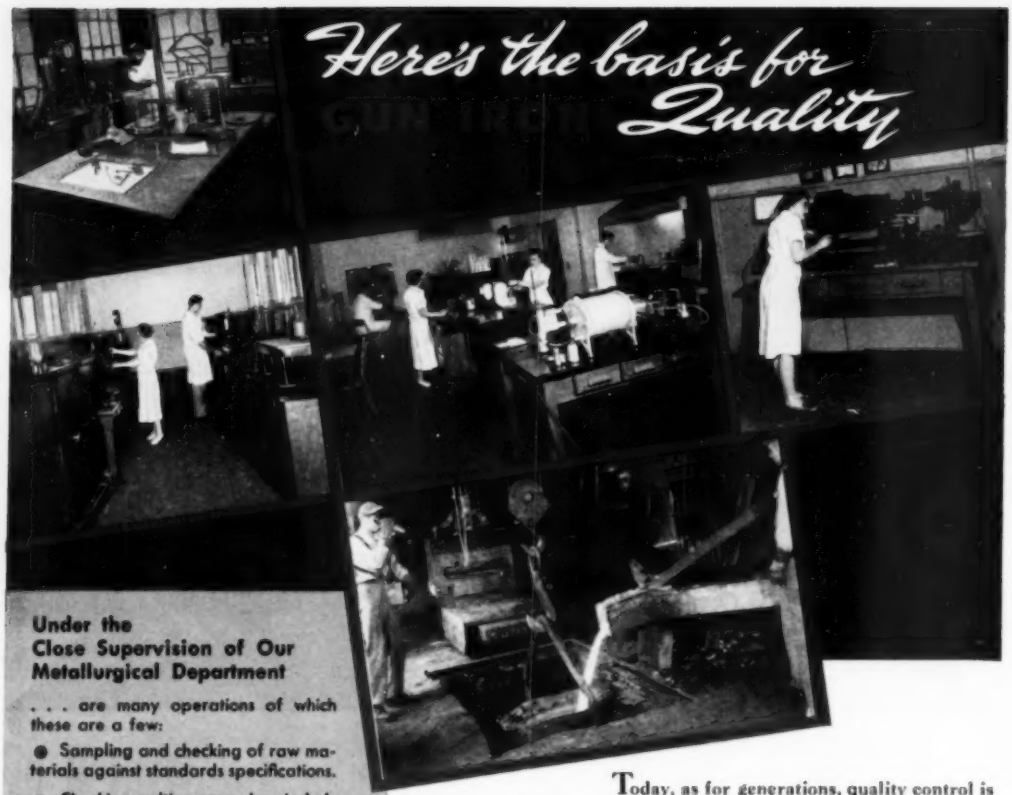

Under the Close Supervision of Our Metallurgical Department

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FRONT COVER ILLUSTRATION:

Milwaukee's new fire-boat "Deluge" undergoing pumping tests in Milwaukee harbor.

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"DELUGE" MILWAUKEE'S NEW FIRE BOAT

By DWIGHT ROBISON

MILWAUKEE is justifiably proud of its new fire boat, *Deluge* which, after successfully passing stringent pumping tests and trial runs, was recently put into regular service following a civic ceremony and a river parade. Exceeded in its pumping capacity only by New York's "Fire Fighter" with its 22,000 gpm, *Deluge* has an installation capable of pumping 12,000 gpm which it actually increased in tests. It is, therefore, a very powerful fire boat and an exceedingly useful addition to Milwaukee's fire fighting equipment. It can get there fast too, with a service speed of 11 knots with both propelling engines operating at 600 rpm.

Deluge was designed by A. M. Deering, naval architect of Chicago, in collaboration with Milwaukee Fire Chief Edward E. Wischer and is classed +A1 for fire boat and harbor service by the American Bureau of Shipping. It has an overall length of 96'7" and a water line length of 93'. The beam (moulded) measures 23' and it has a draft of 6'9". It is of all-welded steel construction and was built by Defoe, Inc. of Bay City, Michigan.

Influencing the design was the necessity of its operating in the vicinity of low bridges spanning Milwaukee's rivers. It was built as close to water level as possible so that it will have clearance under the bascule type of bridges that form part of the city's viaducts but railroad bridges and some of the other bascule bridges at street level will have to be raised to allow the new fire boat to pass.

The boat's power plant consists of four four-cycle six cylinder supercharged diesel engines each rated at 375 hp at 600 rpm. Two of these engines, located aft in the engine room, are used for both propulsion and pumping. The two forward engines are used only for pumping. The two combination propelling and pumping engines are connected to the propeller shafts by clutches operated by air cylinders.

All four engines are connected through vertical type speed increasers and clutches to four standard single stage, double suction centrifugal pumps. These bronze fitted pumps have rated capacities of 3,000 gpm at 150 psi and 1,600 rpm. In spurt tests they have exceeded their rated capacity by more than ten per cent.

Several benefits are realized by using these particular pumps. They are single-stage pumps, occupying less scarce engine room space than multi-stage pumps. Also, they are simpler and easier to maintain than multi-stage pumps, and require stocking of fewer spare parts. And, since they are standard pumps rather than special designs, the cost and availability of spare parts is more favorable.

When working through the city's pipe line system that extends several blocks from the Milwaukee River, the mains of the pipe lines will be fed by hose lines off the deck of the boat and connected to the dockside fire boat terminals.

The two propulsion engines, which can also be put into pumping service, are of the marine direct reversing type. One is a right hand engine and the other rotates to the left. The cooling system of these two engines and the two pumping engines are designed to dissipate 1800 BTU/BHP/HR from jacket water and 350 BTU/BHP/HR from lubricating oil. The normal jacket water and lube oil temperatures at engine outelt is 160° F. Heat exchangers of the shell and tube type are used for engine jackets and lube oil cooling. Both the raw and fresh water supply for the heat exchangers is furnished by the engine driven pumps.

The diesels are air starting, using 250 psi with a starting valve to each cylinder. A tank capacity of 40 cubic feet provides for 40 engine starts, 16 starts or reverses for each of the two propelling engines and four starts for each of the two pumping engines. Two compressors supply air to four 30"x72" air bottles for starting and general utility.

The *Deluge* replaces the steam-driven *Torrent* built in 1910 and purchased second hand by the City of Milwaukee in 1922 for $65,000. The *Torrent* is 120' long, has a 28' beam and 11' draft forward and 12'6" draft aft. This boat has a capacity of 12,000 gpm. Fire Boat No. 15, built for Milwaukee in 1903 at a cost of $97,075, will be continued in service as a reserve. It is 118' long, has a 26' beam and a draft of 9' forward and 11½' aft. This boat's pumping capacity is 9,000 gpm.

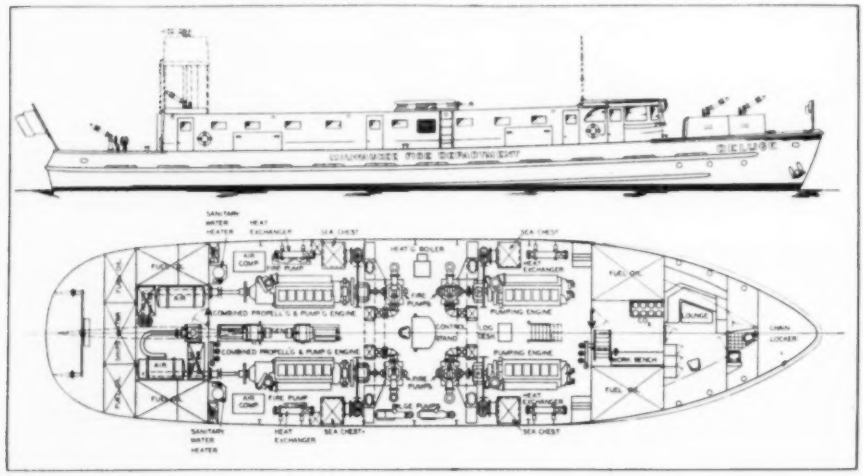
Among the many advantages Fire Chief Wischer finds in Milwaukee's new diesel-engined fire boat are lower fuel cost, quicker response to fire alarms, greater maneuverability, improved uniform pressure of diesel driven centrifugal pumps, elimination of the smoke nuisance and less manpower required to man the *Deluge*.

Over a period of six years Chief Wischer reports that the cost of operating the steam boats, including crews, fuel and boat maintenance, was $624,887. During this period only 33 hours and 17 minutes were actually spent in fighting fires. In 1948 the cost of coal, supplies and maintenance, not including crew expense, for Fire Boat No. 15, was $12,727. During that year the boat travelled 96 miles and was on fire duty 22 hours. Coal alone for Fire Boat No. 15 costs about $35 a day, or over $1,000 a month, just to maintain standby service.

Cost estimates made on the operation of *Deluge* and cost reports received on the operation of other diesel-engined fire boats indicate that the *Deluge* can be operated for not more than 10% of the steam boat cost. This 90% savings does not take into consideration additional savings that will be effected by the reduced crew requirements. The Milwaukee steam fire boats required a crew of 20 men working in three shifts for each boat. With the diesel boat, crew requirements are reduced to 17 men resulting in a saving in crew expense of $11,180 annually. As vacancies occur the crew of the diesel boat will be further reduced with additional savings.

The diesel-propelled *Deluge* makes it possible for the Milwaukee Fire Department to answer fire alarms more quickly. With the steam propelled

Outboard profile and engine room layout on *Deluge*



Deluge running at full speed.

boats, even though steam pressure is constantly maintained, considerable time is lost getting the boats under way to the scene of a fire. This savings in time and the greater maneuverability are factors especially attractive to the Milwaukee Fire Department.

The uniform pressure of the diesel engine driven pumps is a great improvement over the steam engine driven pumps which caused considerable pulsation to the stream of water being pumped, making it difficult to use hand held nozzles.

The Milwaukee Fire Department has had difficulty with the city smoke inspector because of smoke emitted from the coal burning fire boats. Smoke abatement is thus an advantageous feature of the *Deluge*.

All the equipment in *Deluge* is in duplicate permitting the boat to provide about 75% service even though one unit of each type is out of commission. The boat has twin four blade, 40" diameter propellers, twin propelling engines, twin pumping units, etc. Two troughs run transversely from port to starboard, each drawing water from a sea chest port and a sea chest starboard. Hot water jackets are installed around each of the four sea chests to prevent icing. These draw hot water from a heating boiler in the engine room. This arrangement permits the closing off of either side in case the boat is working alongside a shallow bank. Each trough supplies water to suction of two of the four main pumps, which in turn move the water in risers to the main loop situated in the upper engine room. The main loop includes four hose manifolds, two forward port and starboard and two aft port and starboard. Each monitor draws water from the main loop.

There are four monitors available for throwing water. Three of these monitors are fixed and mounted on the main deck, two of which are located forward on raised platforms and one located aft. One monitor is mounted aft on a telescoping tower which can be raised 21 feet from the water line, over the superstructure to give at least one nozzle the advantage of height in fighting water front fires. This monitor is raised or lowered in 45 seconds by a hydraulic lift. This boat is also equipped with 14 discharge ports, 3 inch increased to 3½ inch, 7 on each side. As soon as the present supply of 3½ inch hose in the Milwaukee Fire Department is exhausted, then 3 inch hose will be used.

The pilot house and the upper engine room are all that are included in the *Deluge's* superstructure. Doorways in the deckhouse offer access only to a catwalk and a platform leading to the engine room below. Except for a lounge forward with toilet and shower there are no quarters provided for the crew. Following common fire department practice the boat is considered in the same category as a pumping engine and her crew is berthed in a shore firehouse.

Two 12-inch searchlights are mounted on brackets on either side of the pilot house and two similar searchlights are mounted on pedestals on the main deck aft. A combination windlass and capstan is mounted on the centerline of the main deck forward. Six single mooring bits are located around the main deck railing.

Power for general ship's service is available from two 30 kw, 220 volt a.c. generating sets. The principal auxiliary motors require 220 volt 3-phase a.c. but the current is stepped down to 110 volts through dry-type transformers for the lighting circuits and small motors. Current will be taken from a shore line while the ship is docked. A 3 kw motor generating set can convert d.c. to a.c. for ship's service.

To combat shipboard fires the *Deluge* carries a bank of eight portable 75 lb. CO_2 bottles connected into feed lines distributed to funnels throughout the ship. This system is non-automatic, as an automatic fire protection system is impractical since the boat may often work close enough to fires to cause accidental discharge of the system which would put the boat temporarily out of action.

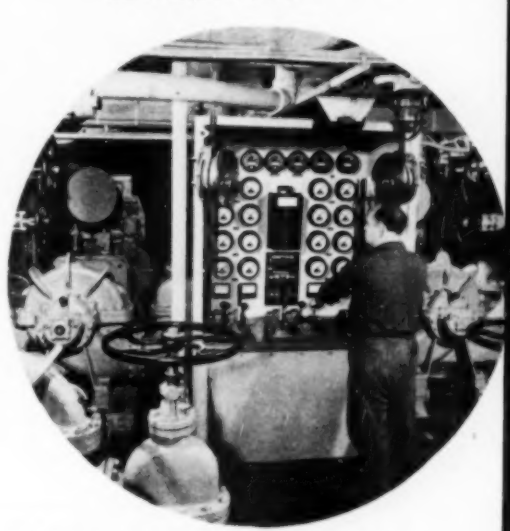
In addition to this system, portable CO_2 extinguishers of ten pound capacity and dry chemical extinguishers of 25 pound capacity are located throughout strategic portions of the engine room.

The boat has two way radio communication and when at its berth dock, it has a dockside connection for fire alarm telegraph register and fire alarm telephone aboard. The vessel has interphone communication throughout.

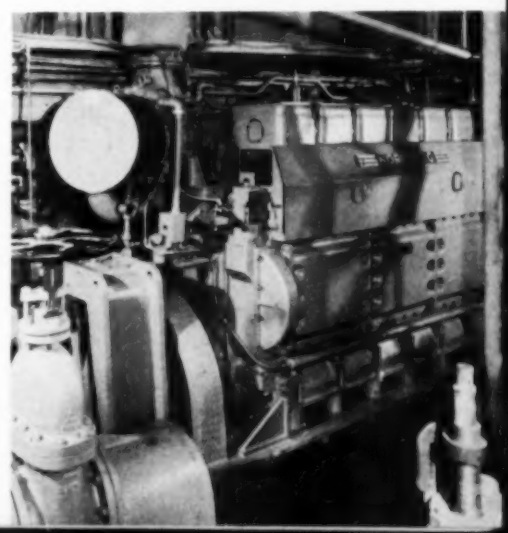
SOME OF THE EQUIPMENT

Nordberg—Main engines, 4 diesels each 375 hp.
Allis-Chalmers—Pumps.
Twin Disc—Propulsion clutches.
Fawick Airflex—Pump drive clutches.
Falk—Speed increasers.
Gardner-Denver—Compressors.
Ideal-Electric—Combination Windlass capstan.

Engine room view. Propulsion and pumping control booth in center. Left and right can be seen two of the four Allis-Chalmers single stage pumps rated at 3,000 gpm each at 150 psi and 1,600 rpm.



One of the four similar six cylinder, 9 inch by 11½ inch Nordberg supercharged diesels. Rated at 375-hp each at 600 rpm, two are used for either propulsion or pumping and two for pumping only.



UNION PACIFIC ABANDONS COAL FIRED STEAM OPERATION

City of Los Angeles streamliner: Electro-Motive diesel-electric locomotive.

Arthur E. Stoddard, President of Union Pacific. A lifelong railroad man, Mr. Stoddard started with the Frisco Lines in 1915 as a shop apprentice but already had youthful experience in railroading when his father had a grading subcontract in 1906 in the building of the Rock Island line. Entering Union Pacific in April 1916, he has been with them continuously from that date with the exception of military service in both World Wars. A Colonel in the last war seeing service in the Near East, England and France, Mr. Stoddard now has the rank of Brigadier General in the Officers' Reserve Corps of the U. S. Army.

City of Portland leaving Portland, Oregon: Electro-Motive diesel-electric.

$69,000,000 Diesel Locomotive Purchase Ranks With Largest in Railroad History: 740,000 Diesel Horsepower to Roll on Vast Western Trackage

By CHARLES F. A. MANN

AMERICA has only one corporation and one railroad like it. It is the Union Pacific System, parent company of the five regional companies dating back to the pioneering era of the half-continent west of the Missouri River.

Serving directly the densely populated belt in Southern California, and the rich timber and agricultural belt of the whole Pacific Northwest, and, via the Southern Pacific West of Ogden, all of San Francisco Bay, the Union Pacific is situated in as nearly geographic and economically foolproof a region as can be found anywhere in the world.

Somewhere, all the time, in depression and boom, along the far-spread routes in the "Union Pacific West," business is either booming, normal or busted: the tourist crop lush or absent and the weather "perfect" or "unusual!" That's why the Union Pacific is America's No. 1 revenue earner and one of the most unusual corporations in all the world.

Those bright spots of business along its sprawling network of beautifully kept trackage include

fabulous coal and iron mines, lush oil and gas wells and even cold artesian water wells in a parched barren desert that bring in almost as much per barrel of water as oil wells do at Wilmington, California.

It again follows, therefore, that under the astute Harriman-Jeffers Pre-War and Wartime leadership, followed by the Roland Harriman-Geo. Ashby leadership that of all U. S. & Canadian railroads, the Union Pacific had the most up to date motive power throughout its entire system of any U. S. Railroad, and was well prepared for the tremendous wartime traffic, largest ever known in the history of any U. S. or Canadian System.

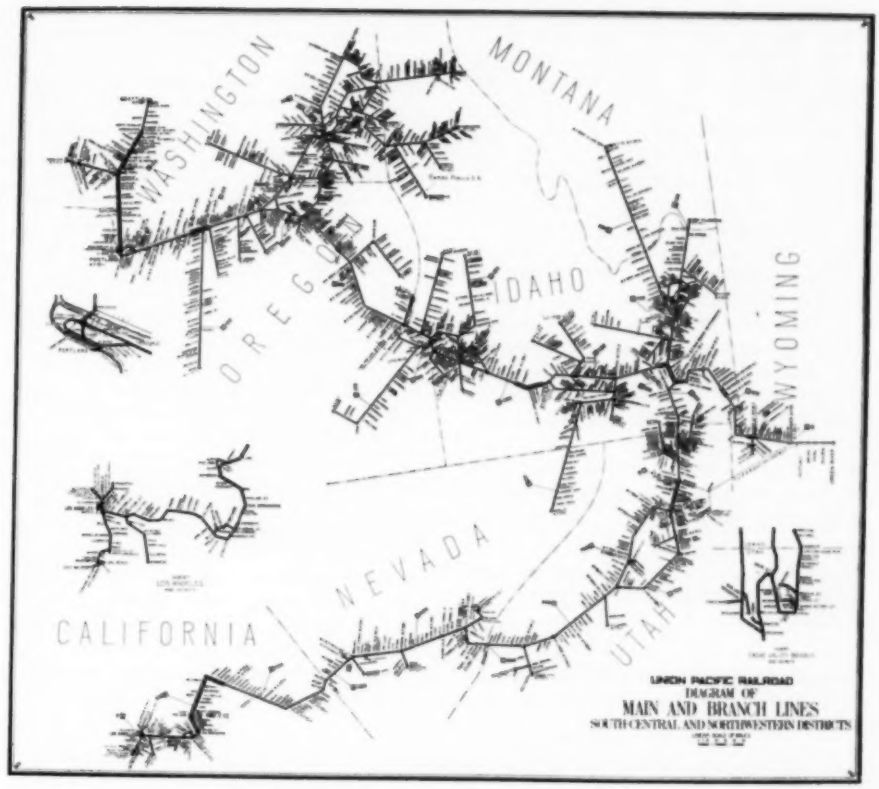
Based on its long and successful pioneering and experienced over varied terrain, Union Pacific was able to handle up to 125 trains per day across its Omaha-Ogden "Bridge" line, and traffic loans of even higher density between Cheyenne, where the Kansas City-Denver Line joins, and Green River, where the Northwest Line to Portland and Puget Sound takes off.

Across the rooftop of America, the U.P.'s fleet of coal burning locomotives including the largest on earth, rolled sometimes ten trains per hour east and west—freights. On top of this came the many-sectioned passenger fleets bound from points on the Coast to Chicago, half of them diesel drawn and the rest, including mail trains, hauled by steam.

Remember, all this fleet was modernized, and much of it new just prior to the war. The immediate pre-war smaller mainline locomotives took up heavier loads on branchlines. It was America's greatest spectacle of railroading, which, with the mighty Pennsylvania operation, paved the way for many technical improvements in railroading. The Union Pacific had hardly begun its pioneer diesel streamliner operation in 1934, with the first tiny 3-car train, closely followed by the three increasing sized "City of Portland" crosscountry streamliners, when it ironically began the most extensive, thorough venture ever undertaken into big steam power in history. Strangely, it suffered the pioneering headaches with diesel, while it spent over $100,000,000 in new and modernization of old steam locomotives!

The rich Wyoming Coal Belt owned by the Company in the exact middle of its route, kept its older directors and officers with a constant eye toward utilization of its own "cheap" coal, long after progressive systems such as the Santa Fe, Great Northern, Milwaukee, Erie and other lines were busy buying diesels in wholesale lots. Until the price of coal went up and maintenance of its huge fleet of steamers followed wage rises upward, coal fired steam on the Union Pacific was practically unrivaled.

It was, therefore, an amazing right about face when President George Ashby announced on three consecutive times in the years 1946 to 1948 that the Union Pacific would boldly "go diesel" on its entire mainline network to Los Angeles and Portland-Puget Sound with an added purchase of 379 diesel locomotive units, which would



bring the total to almost exactly 740,000 diesel horsepower, after certain ownership transfers involving jointly owned locomotives with the Southern Pacific and Northwestern.

In 1946 the Company authorized the expenditure of $23,081,621 for 162 locomotive units, including 29 diesel switchers. In 1947, 23 additional units were authorized at a cost of $4,143,140. In 1948 the giant diesel year on the U.P., a total of 173 diesel units at a cost of $28,270,227 were ordered, the bulk of which were received in that same year, and the remaining balance early in 1949.

The die was cast. Postwar costs of rehabilitating the coal fired steamers; the 30% overall economics of diesel; the fact that the company, at Los Angeles had run into more oil than it ever possessed in the way of coal; the need for increasing the capacity of the long, single track Western lines; the need for moving everything, including freight and passenger trains at a uniformly high average rate of speed, the high price of a large quantity of depreciated old steamers—some 500 of them in 2½ years went to the high-price scrap steel market, largest locomotive scrapping program in history—all set the stage for diesel on America's most efficient coal locomotive railroad.

Long installations of Centralized Traffic Control enabled the faster power, most of it equipped with dynamic braking, to go uphill and downhill faster and smoother. Heavy curvature on parts of the Los Angeles Line and on many parts of the Northwest Line, particularly the complex branchlines in Washington's wheat country, takes the diesels easier and bridges that were fine on the "second rebuilding" forty years ago, again were extra safe with the light wheel loads of diesel locomotives.

Smoke and noise reduction in the terminals, long an agitated subject against this pioneer system, took up the diesel switchers instantly and with pleasing public relations resulting.

Today the Union Pacific has 536 diesel units, embracing 96 passenger units; 240 freight units, 11 heavy duty units; 5 all purpose units; 17 road switchers and 167 switchers. Fast pace for a road almost 100% dependent on coal changing to one of the Big Three world diesel users, all since the close of World War II.

Of the total, 379 units were obtained since the War. From 1935 to 1945 the Company purchased a total of 157 units, which included 93 General Motors units; 54 from Alco; 6 from Baldwin and 4 from Fairbanks Morse. These included the historic Mainline Streamliner diesel units, some of which are the old 201-1800 hp. Electro Motive Division units.

In 1946, the diesels purchased were as follows:

162 units divided as follows: 72-1500 hp. EMD freight units; 40 Alco-1500 hp. freight units; 6-2000 hp. Alco passenger units; 15-1500 hp. EMD passenger units; 25-1000 hp. switchers from EMD and 4-1000 hp. switchers from Fairbanks Morse. All for a total of $23,081,621.

In 1947, the diesels purchased were as follows: 10-2000 hp. Fairbanks Morse passenger units; 11-2000 hp. heavy duty units from Fairbanks Morse; 1-1500 hp. road switcher from Alco and 1-380 hp. switcher from G.E. A total of only 23 units. Cost, $4,143,140.

In 1948, the diesels purchased were as follows: A total of 173 units, plus a 1949 carryover of 21 for the following year—194 units costing $28,270,227. The total breaks down as follows: 80-1500 hp. freight units from EMD; 48-1500 hp. Alco freight units; 12-1500 hp. passenger units from EMD; 8-2000 hp. passenger units from Alco; 20-1000 hp. EMD switchers; 5-1000 hp. switchers from Baldwin; 15-1500 hp. road switchers from Alco; 5-1500 hp. all purpose units from Fairbanks Morse and 1-1500 hp. road switcher from Baldwin.

The complete motive power roster for diesels on the entire Union Pacific System is shown in accompanying tables.

The 167 switchers are scattered over the entire System, and have already replaced ¾ of the steam switchers.

Putting over 700,000 diesel horsepower to work on a complex railroad operation, was no mean chore. Proceeding swiftly and with the shrewd ability to get exacting performance in the tough spots with minimum of falldown of the human element, President Ashby gathered around him a separate staff of advisers to superimpose the diesel operation over the two long mainlines out of Green River and Salt Lake; completely dieselize the Washington branchline territory in the wondrous Palouse Country wheat belt and prepare to run diesels through Green River to Omaha and Chicago on all passenger and mail trains in those sections.

This involved the cutback of steam power and all its complicated facilities on a total track mileage of nearly 5,000—the distance from New York to Constantinople; revamping of the skeletonized remaining general shops into diesel shops; setting up various terminal road and light repair facilities; track servicing facilities for freight and passenger diesels and switchers at key points, and the orderly culling out of a fleet of $200,000,000 worth of good, yet expensive steam power, the very choicest and scrapping the rest. Steam power yet remaining will operate mixed with diesels between Green River, Wyoming, heart of the U.P. coal belt, to Cheyenne and Omaha, on the mainline; the "flatcountry" branchlines and on the Cheyenne, Omaha-Kansas City Line. These too will eventually be replaced with diesels.

J. W. Burnett, veteran motive power authority, carried through on the special research and assignment work for Mr. Ashby, operating out of Los Angeles. Newly elected President Arthur Stoddard, succeeding Mr. Ashby last fall, found the U.P. diesel program almost 2/3 completed, and the pattern for dieselizing a section at a time, functioning smoothly.

Broadly, the new Alco freight diesel units were assigned to the Milford-Green River-Salt Lake part of the Los Angeles line; from Ogden to Green River; and from Cheyenne and Green River and on to Pocatello. The Electromotive Units were assigned to the Los Angeles-Milford segment; Pocatello to Salt Lake; Pocatello to Huntington-Rieth, Oregon. Each of the two types were therefore permanently assigned to convenient operating regions. The 24 Alco and F.M. 2000 hp. passenger units have been confined to the Los Angeles-Green River-Denver section, while all the rest, embracing 54 various sizes of EMD units took

The running time of this freight train, a 24-hour special, has been cut 50 per cent with the use of diesels: Alco diesel-electric.

Diesel repair section of the U.P. general repair shops at Los Angeles.

Table I

Union Pacific Railroad Company
Research & Mechanical Standards.
Ownership of Diesel-Electric Power Units including UP-C&NW Jointly Owned City of Denver Unit CD 05-06 ABC

Type	HP	Bldr	Road Numbers	A	B	C	Total Units	& HP	
Passenger	1200	EMD	CD 05-06 ABC	2	2	2	6		7,200
			CD 07 ABC	1	1	1	3		3,600
				3	3	3	9	9	10,800
	1500	EMD	900-910	11					
			900-905, 7&9 BC		8	8	27	27	40,500
	1800	EMD	983-984 BC		2	2	4	4	7,200
	2000	EMD	986-87-89-90	4					
			985-87-88-90 B		4				
			985-87 C			2	10		20,000
			991-999	9					
			992-4-6-8 B		4		13		26,000
				13	8	2	23		46,000
		FM	700-707	8					
			700-2-3-4-6 B		5		13		26,000
		ALCO	600-607	8					
			600&2, 604-7 B		6		14	50	28,000
				43	32	15	90	90	158,500
Freight	1500	EMD	1400-1463	64					
			1400-1458 BC		30	30	124		186,000
			1550-1563	14					
			1550-1562 BC		7	7	28		42,000
				78	37	37	152		228,000
		ALCO	1600-1643	44					
			1600-1642 BC		22	22	88		132,000
				122	59	59	240	240	360,000
Heavy-Duty	2000	FM	1360-1370				11	11	22,000
All-Purpose	1500	FM	1325-1329				5	5	7,500
Road Switch	1500	ALCO 4-Whl	1191-1195				5		7,500
		ALCO	1180-1190				11		16,500
		BALD 6-Whl	1250				1		1,500
								17	
Switch	1000	EMD	1000-1095				96		96,000
		ALCO	1100-1153				54		54,000
		BALD	1200-1210				11		11,000
		FM	1300-1304				5		5,000
	380	GE	1399				1	167	380
Total								530	739,880

Territory	Locos. No.	H.P.	EMD A	EMD B		ALCO A	ALCO B		Total A	Total B	
No. Units		1500	78	74	152	44	44	88	122	118	240
Active			76	70	146	42	42	84	118	112	230
Los Angeles-Milford	14	6000	28	28	56				28	28	56
Milford-Green River including Salt Lake & Provo	10	4500				20	10	30	20	10	30
Ogden-Green River	10	4500				10	20	30	10	20	30
Provo-Iron Mauntain	4	4500	4	8	12				4	8	12
Pocatello-Salt Lake	5	4500	10	5	15				10	5	15
Pocatello-Huntington	9	4500	18	9	27				18	9	27
Huntington-Rieth (65-12)	5	6000	10	10	20				10	10	20
Cheyenne-Green River and/or Pocatello-Green River	8	4500				4 8	8 4	12 12	12	12	24
Extra Unassigned 65-12 62-15	2 2	6000 6000	4 2	4 6	8 8				6	10	16
Total Locomotives	69		76	70	146	42	42	84	118	112	230
Extra—Protection and and Shoping			2	4	6	2	2	4	4	6	10
TOTAL			78	74	152	44	44	88	122	118	240

Table II

Assignment of Diesel Road Freight Units

Assignment	No. Locos and HP	No. Units	EMD 2000 HP	EMD 1800 HP	EMD 1500 HP	ALCO 2000 HP	FM 2000 HP
Owned	.....	81	23	4	27	14	13
City of St. Louis	1—4000	2	2	..	..	..	
City of Los Angeles	4—4000	8	8	..	..	..	..
LA-Green River	5500	2	..	..	2	..	..
City of Portland	4—4000	8	8	..	..	..	..
Port-Green River	5500	2	..	..	2	..	..
City of San Francisco	2—5000 1—5600	9	5	4	..	..	..
Trains 29-11-18-34-33-17-12-30 Salt Lake-Port	5—4500	15	..	..	15	..	..
Trains 11-18, Poca-Port	6000	2	..	..	2	..	..
Trns 1-2 LA-Green River Trns 37-38 LA-Denver	6—6000	18	..	..	..	6	12
Trns 3-4 LA-Green River	3—4000	6	..	..	..	6	..
Maintenance relief and shopping:							
Los Angeles	.....	5	..	..	2	2	1
Omaha (Shop)	.....	2	..	..	2	..	..
Portland	.....	2	..	..	2	..	..
Total	.....	81	23	4	27	14	13

Table III

Approximate Passenger Diesel Assignment Followed Daily

the main streamliner and heavy passenger-mail trains through to terminals.

The road switcher assignment in Rieth, Ore.-Spokane-Wn. branchline territory is a virtual railroad operation in itself, displacing twice the quantity of old light steamers and doing twice the useful work. Elsewhere is a detail on the unique pool operation over the fabulous wheat country operation done under unusual circumstances.

What used to be an agonizing double, triple and even quadruple header move up Cajon Pass out of San Bernardino is now a precision tie-in with the diesel pace of the huge Santa Fe operations which share the same trackage between Barstow-Yermo and "San Berdue." The Alco diesels formerly assigned were changed to EMD's over "The Pass."

What was difficult operation in the torrid desert heat from Barstow to Las Vegas and Salt Lake, with water supply problems, curved track, steep hills and low desert sinks, is now swift diesel

Table IV

Road Freight Service for the Year 1948

(As shown on Auditor's Forms 522 and 524)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
						DIESEL							
Cost Per Train Mile—Road													
Power Unit Repairs (3 Diesel Units)	57.81	78.76	50.99	48.48	47.79	45.09	51.34	52.32	58.39	57.11	59.08	54.44	55.13
Enginehouse Expenses	6.03	4.96	3.84	3.82	4.61	5.73	5.74	6.78	6.07	5.32	5.76	5.74	5.37
Fuel	69.25	78.30	66.94	59.24	73.62	72.21	69.47	70.67	68.38	63.35	68.30	65.39	68.76
Lubricants	4.29	3.77	3.32	4.22	3.98	5.19	4.46	4.38	3.89	3.83	4.03	3.92	4.11
Other Supplies	.32	.14	.15	.82	.82	.63	.64	.56	.81	.61	.85	.72	.59
Enginemen	37.83	37.64	39.08	38.42	40.62	44.01	45.65	44.25	43.64	39.21	44.03	48.18	41.88
Trainmen	63.71	63.19	59.66	59.97	60.30	62.53	65.54	64.45	57.88	58.58	62.25	61.59	61.64
TOTAL	239.24	266.76	223.98	214.97	231.74	235.39	242.84	243.41	239.06	228.01	244.30	239.98	237.48
						STEAM							
Cost Per Train Mile—Road													
Power Unit Repairs	62.14	56.60	41.63	49.58	52.46	49.04	40.95	42.77	43.98	46.58	47.61	51.08	48.70
Enginehouse Expenses	17.36	18.13	16.51	16.63	17.18	16.52	15.35	14.59	16.19	16.30	16.86	18.20	16.65
Fuel	115.87	119.02	127.70	123.31	111.92	104.79	99.57	101.78	101.00	103.95	111.87	113.71	111.21
Lubricants	2.71	2.87	2.68	2.89	2.98	3.46	3.03	3.00	3.63	3.71	3.77	3.42	3.18
Other Supplies	5.71	5.82	5.81	5.63	5.20	5.64	4.79	5.81	5.17	5.85	5.63	6.32	5.62
Enginemen	38.92	37.02	38.16	37.73	37.00	38.75	37.01	37.56	40.91	42.55	42.29	44.80	39.39
Trainmen	53.03	48.95	50.14	50.68	49.31	52.38	50.90	51.51	50.71	52.75	54.34	55.25	51.66
TOTAL	295.74	288.41	282.63	286.45	276.05	270.58	251.60	257.02	261.59	271.71	282.37	292.78	276.41

Road switcher and freight train near Thornton, Oregon. Fairbanks Morse locomotive.

Union Pacific freight near Kamela, Oregon: Electro-Motive diesel-electric.

operation straight through to Las Vegas and Salt Lake. One third the diesel horsepower moves the same freight that steam units used to.

Twenty four hours have been chopped off the Los Angeles Livestock Special, making it possible to haul swiftly a full roller bearing train of stock from Salt Lake to Los Angeles in 26½ hours, or nearly 50% reduction in time on the road and nearly 75% saved for a complete stop to water stock enroute. The cattle like it: the shippers like it and the railroad can make three sets of equipment handle the service where it took five sets before. All because of diesels!

The beautiful Blue Mountain belt from Huntington to Rieth (Pendleton) Oregon was just that, but with its curves, steep grades and heavy, sudden snows, an operating headache. Half the diesels haul the freight that formerly required not only twice as many steamers but much helper service on two legs of the journey. All passenger service has likewise been dieselized, and now this twisting web of key single track, formerly a bot-

Table V

Road Freight Service for the Year 1948

(As shown on Auditor's Forms 522 and 524)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
						DIESEL							
Cost Per 1,000 GTM—Road													
Power Unit Repairs (3 Diesel Units)	20.69	27.61	17.29	15.77	14.56	13.52	16.15	16.14	18.53	18.28	18.67	17.87	17.92
Enginehouse Expenses	2.20	1.74	1.30	1.24	1.41	1.72	1.81	2.08	1.93	1.70	1.82	1.89	1.74
Fuel	25.22	27.45	22.70	19.28	22.43	21.67	21.86	21.80	21.70	20.28	21.58	21.47	22.29
Lubricants	1.56	1.32	1.13	1.37	1.21	1.56	1.40	1.35	1.23	1.23	1.27	1.29	1.33
Other Supplies	.12	.05	.05	.27	.25	.19	.20	.17	.26	.20	.27	.24	.19
Enginemen	13.78	13.19	13.26	12.50	12.38	13.20	14.37	13.65	13.85	12.55	13.91	15.81	13.54
Trainmen	23.20	22.16	20.24	19.52	18.37	18.76	20.62	19.88	18.37	18.76	19.67	20.22	19.98
Total	86.77	93.52	75.97	69.95	70.61	70.62	76.41	75.07	75.87	73.00	77.19	78.79	76.99
						STEAM							
Cost Per 1,000 GTM—Road													
Power Unit Repairs	24.64	21.84	16.50	17.93	18.61	18.14	15.26	15.42	16.48	17.78	18.47	21.39	18.54
Enginehouse Expenses	6.92	6.94	6.33	5.96	5.97	5.87	5.60	5.23	6.22	6.51	6.68	7.32	6.30
Fuel	46.21	45.58	48.99	44.14	38.92	37.23	36.35	36.49	38.80	41.49	44.30	45.71	42.02
Lubricants	1.09	1.11	1.07	1.05	1.06	1.29	1.14	1.09	1.37	1.43	1.47	1.44	1.22
Other Supplies	2.27	2.25	2.31	2.04	1.85	2.09	1.78	2.10	1.94	2.23	2.18	2.65	2.14
Enginemen	15.52	14.18	14.64	13.51	12.86	13.76	13.51	13.46	15.71	16.98	16.75	18.01	14.91
Trainmen	21.15	18.75	19.23	18.12	17.15	18.60	18.58	18.46	19.48	21.06	21.50	22.21	19.52
Total	117.80	110.65	109.07	102.75	96.42	96.98	92.22	92.25	100.00	107.48	111.35	118.73	104.65

Fairbanks-Morse road switcher used in the "helper" service out of San Bernadino.

Operating sheet for one month on typical road switcher on the Union Pacific.

tleneck, but now a dieselized, centralized-traffic-controlled, fast mainline, is reducing speed but *increasing* average running time!

The last of the good oil fired steamers work down the Columbia River to Portland, but for swift, smooth fast freight, mainline diesels have now been extended from Portland to Seattle and Tacoma. To the end of stepping up speed of time freights on this double track water level speedway, a 4 unit and a 3 unit EMD freight diesel began operating two round trips each 24 hours, *plus* one round trip passenger move. Three 190 mile round trips each 24 hours with merely *two* diesels!

The Northwest District is nearest to the end of steam, with 13 "City of Portland" 2,000 hp. EMD passenger units; 34 diesel switchers; 7 road-switchers in the Spokane-Ayer Local service and 61-1500 hp. EMD freight diesel units in the Pocatello-Reith-Spokane-Butte region.

Mileage statistics are as follows:
The U.P. is now averaging close to 1,700,000 locomotive miles per month in passenger service. They are piling up an average monthly mileage of 18,865, straight across the whole roster of 90 units, and a daily average of 674.

The freight units are divided into four assignment regions for statistical compilation. A typical month follows:

1—ALCO UNITS—Working Los Angeles, Salt Lake, Ogden, Green River—87 Units

Total Miles for Month	754,283
Average Monthly Miles	8,670
Average Daily Miles	306

Switching operations with diesels in the Pocatello yards.

II—EMD UNITS—Working Los Angeles, Salt Lake, Green River, Pocatello, Huntington 124 Units

Total Miles for Month	971,882
Average Monthly Miles	7,838
Average Daily Miles	282

III—EMD UNITS—Huntington-Reith—28 Units

Total Miles for Month	179,500
Average Miles	6,411
Average Daily Miles	225

Already over 2,000,000 diesel freight miles per month for a railroad that piled up not *one* diesel road freight mile scarcely 2 years before!

Every railroad operator in the U.S.A. has waited so long for an operating picture of conditions on the Union Pacific that DIESEL PROGRESS is pleased to be able to present through the courtesy of Messrs. Ashby, Stoddard & Burnett the full picture for 1948, on these pages.

Two simple figures will be of deep interest—and that is the system average of a cost of $1.0465 per mile averaged out for each 1000 tons gross, carried one mile—the old 1,000 GTM Statistic, for steam, as compared with $.7699 per 1,000 GTM for diesel—a visible net saving of 30 cents per 1,000 GTM for the entire railroad for one full year!

Threading the low creeks and draws that go upward and inland into the heart of the Palouse wheat country in the Blue Mountain foothills of Washington and Oregon and a thin slice of the western Idaho panhandle, the Union Pacific "goes everywhere" into this wonderful, steady revenue producing territory. At the end of these little branchlines are such "name" towns as Moscow, Idaho; Colfax, Washington; Lewiston, Idaho; Walla Walla, Wash., the mining town of Wallace, Idaho, famed for its lead, zinc and silver ore production and the college town of Pullman, Washington.

These country lines—create a perfect "natural" for old fashioned railroaders. Just use up the old high wheelers or switchers, they generally reason. Not so with the Union Pacific.

Reversing totally the usual method, the Union Pacific blandly installed 7 road switchers to serve an area larger than Connecticut, displacing 30 steamers and a huge investment in water, fuel and roundhouse facilities.

By operating each one of these units on a remarkably tight turnaround, they have set-up an operation that renders sterling service, moves the empties and the full carloads back downhill, with precision and aplomb.

DIESEL PROGRESS prevailed upon Mr. Burnett to release a hand-written operating sheet for a full winter month on this whole remarkable operation, for typical road switcher No. 1182, identical with the other six in the fleet. We have printed it for our readers benefit.

A month's cycle of operations makes impressive reading. The points mentioned lies as far apart as New York and Baltimore. At the end of 30 days, No. 1182 handled 41 complete trains; moved 358 loads, 278 empties and 29,893 gross ton miles in one direction, *plus* 331 loads, 265 empties and 28,979 gross ton miles a total of 2827.3 road miles; performed 44 hours and 55 minutes of road switching in addition; plus 152 hours and 20 minutes of yard switching—a triple function, and was stuck a total of 191 hours 20 minutes for layover and 61 hours for "held for work." Proof that a nexpensive 1,500 hp. road switcher (they include both 8 and 12 wheels) will pay off even on territory considered typical for 1910 model lightweight steam power.

Mr. Burnett reports all 7 followed approximately the same cycle of useful productive road and switching work for the company.

In a typical month, these 7 road switchers, all Alco six wheel truck road switchers, rolled up some important statistics for the U.S. railroads to ponder and analyze:

Trains operated	311
Total cars moved	5038
Train miles	23911
Road switching hours	373
Yard switching hours	1334
Utilization percent of time in month	69.2%
Percent availability	94%
Average no. of trains moved per day	10
Cars per train	16.2
Tons per train	737.3
Miles per train	76.9
Road time per day	9 hrs. 22 min.
Miles per hour on road	9.1
Average miles per locomotive	3016
Average hours in road and yard switch service	1694 per month.

The heavy curvature and bridge situation will respond via the purse most favorably in these sections, most of which are now under the world's longest centralized traffic control operation, that has increased, with diesels, track capacities throughout the area by about 85% of double track at one tenth the cost.

Diesels are given running repairs at Huntington and Rieth, Oregon, and the Portland Terminal, Ogden, Utah; Cheyenne, Wyoming, and Milford, Utah. Inspections and heavy running repairs are performed at Green River, Salt Lake, La Grande, Oregon; Denver, Colorado; Los Angeles, Calif.; Omaha, Nebraska; Pocatello, Idaho, and Las Vegas, Nevada. General repairs are done at Los Angeles, Omaha and Pocatello.

The Los Angeles general shop is the only one used exclusively for diesel. It is a modern rebuilt shop that can perform work efficiently. The general shop program requires each diesel unit to receive a general repair once each 12 to 15 months; and a rebuild or complete total repair once at the end of each 5 years.

Union Pacific will certainly pile up international records under its new President, tall, taciturn Arthur Stoddard.

Photographs through the courtesy of the Union Pacific Railroad.

South view of the general repair shops of the Union Pacific at Los Angeles showing the servicing pits.

Baldwin switcher used on Union Pacific.

WAR ON WEEDS

Diesel road machine pulling weed sprayer tank and 85 foot boom in Montana wheat field.

By F. HAL HIGGINS

HENRY SHEFFELS is one of those frontier American types who grow big enough to fill the opportunities that confront them in building their businesses, communities and States. Sheffels is both diesel dealer and farmer in the great open spaces of Montana, the third largest state in area but the one with more space and elbow room for its citizens than either of its rivals in square miles. With war prices on wheat, naturally this has been the big crop for Montana farmers. Sheffels farms 8,000 acres in a 50-50 fallow-crop system followed by leading wheat growers all through the Northwest. With his dealership in diesel tractors, engines and road machines located in Great Falls, his farming operations are in that area.

The experiences and teachings of conservationists over the past 15 years are seen in the layout of the Sheffels wheat farming acreage. It is strips of 10-rod widths, alternating fallow and crop to beat soil drifting. The strips lie at right angles to the prevailing winds, which can really get you down if you have never encountered them before. So, his diesel farm equipment is also designed and hooked up to cover these 10-rod strips without waste of time, labor and fuel.

The trashy fallowing system practiced by Sheffels and neighbors catches the snow and holds it for penetrating moisture that produces crops year after year where the old clean cultivation system caused top soil blowing, drying out and short crops from lack of moisture in more years than old timers care to recall. But another growing problem that kept creeping up to rob the grain farmers was weeds. Wild mustard and penny cress were the two worst offenders that were cutting several bushels of wheat off the potential acre yields each year. Then came 2,4-D, and in 1947, which Sheffels figures added 30% to his crop while several neighbors found their fields not worth harvesting where there was no 2,4-D treatment.

Sheffels decided that spraying rather than dusting was the better way of applying 2,4-D to his wheat fields to knock out the weeds. He has been using Dow's "Esteron 44" at the rate of a pint to 10 to 12 gallons of water per acre through an 85-foot boom that covers his 10-rod strips at each round of the field. It was in the type of machine on which he used to hang his sprayer and boom that Sheffels showed his practical diesel know-how. He took one of his Caterpillar Diesel Autopatrols that have become popular for road and street building and maintenance all over the map as well as in the recent World War campaigns. The sprayer tank is mounted on a 2-wheel cart towed behind the Autopatrol with Sheffels' own design and construction of the 85 ft. boom to cover the wide land evenly and at top speed for big results. Sheffels is beginning to figure it is time to start adding commercial fertilizers, as he believes farming is a "put-and-take" business that calls for returning to the soil as much of the minerals as are taken out by crop. He knows he has erosion and weeds whipped now, and he sees the long-pull wheat farming system a sound one if live stock, fertilizer and more grass are introduced for the lower priced crops of grain to be grown in the declining price years ahead.

Sheffels also made a diesel combine hook-up that multiplies the labor output of the tractor operator to equip his skilled farm machine labor to earn top wages and yet cut costs by multiplying and easing his work in harvesting. Caterpillar Tractor Co. engineers years ago worked out a 2-combine hookup behind one big crawler tractor. Many of big-hitch ideas were gathered by dealers and engineers from the Montana, Oregon, Washington and California areas where they had been developing since the settlers came out over the Oregon trail to start homesteading. They found they had to multiply the animal power each man worked in order to get farming work done at bottom costs to meet world competition for wheat. Sheffels' 1949 combine hook-up is the last word in efficient use of the big crawler diesel tractors in getting all the crop harvested with a minimum of labor and time lag to cut hazards of weather and falling wheat markets.

Besides owning the Central Machinery Co., dealership in Caterpillar farm and road machine lines, Sheffels is also on the board of directors of the Farm Credit Board, Land Bank, Production Credit Corporation, Bank for Cooperatives, and Federal Intermediate Credit Bank in the 12th Farm Credit district embracing four states in the Northwest.

BIG WESTERN TRUCKER HAS

DIESEL MAINTENANCE KNOW-HOW

By JAMES JOSEPH

GARRETT FREIGHTLINES, INC., one of the largest privately-owned, long-haul truckers in the U.S., maintains complete diesel overhaul shops at its main base, Pocatello, Idaho, hub of a yearly 11,192,000 line mile transportation net that operates 539 pieces of rolling equipment in six western states.

Garrett, western trucking pioneer, has come up with another trucking "first" and now has 62 new, 245 h.p. tractors, all of them blower equipped for its high altitude runs, 90% of them above 3000 feet. The line's highest run is 7000 feet—between San Francisco and the Inter-Mountain states.

Garrett is probably the only operator in the west that maintains two separate and distinct repair shops for diesels—both in Pocatello. One is a service shop where road-weary diesels come for routine check-up and maintenance. But largest and most impressive for a privately-owned line is its rebuild shop, which is a firm advocate of shop cleanliness. But it always wasn't that way.

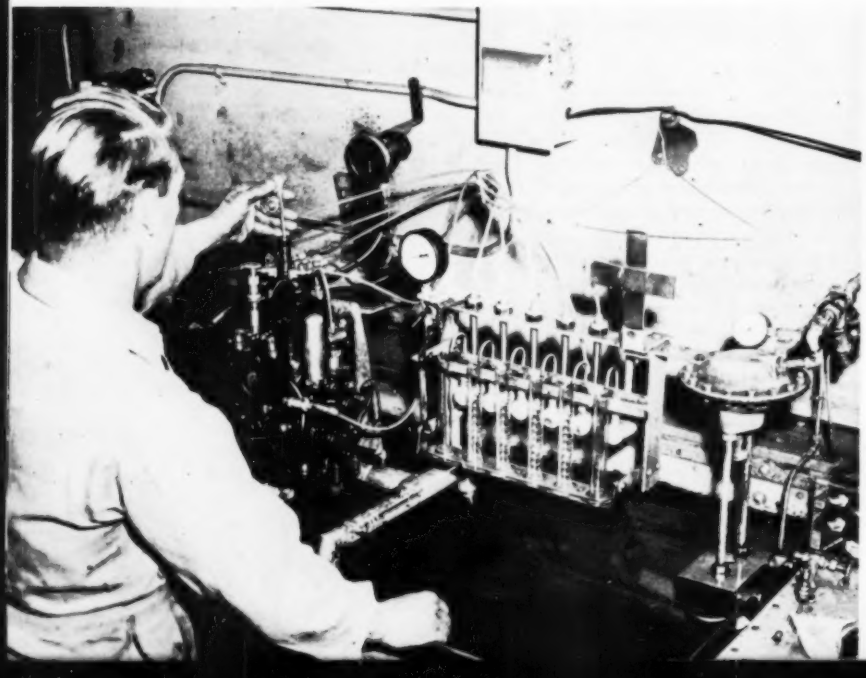
Garrett has had its new diesel repair shops for 5 years now—and bases its maintenance on cleanliness. Earlier it experienced major overhauls every 60,000 miles—but now, with improved shop techniques, it has increased mileage over long-hauls to 101,000 miles . . . last year's fleet average—and has cut road failures by 50%. Cleanliness and better workmanship during the last five years accounted for most of this saving.

Garrett's pioneering of the natural aspirated engine, began in 1945, when the company agreed to run road tests. The first natural aspirated engine was put into "chain gang" operations, and driven continuously by the company's 275 line drivers. Garrett first operated four new, all natural aspirated, standard models. Yet, despite many progressive changes in the engine—based on Garrett's road testing—there were still objections to its high altitude performance. So they added superchargers. Today this engine is turning out 140,000 miles a year or better over routes exceeding 3000 feet. Garrett still operates 75 natural aspirated engines over lower altitude runs, and is gradually changing these engines to a model with horsepower boosted to 165 h.p. at 1800 r.p.m. This has increased efficiency on low altitude runs.

Using supercharged equipment combined with a new plan to switch from truck-and-trailer to semis and tractors, the company has increased yearly unit mileage by 50%—with the same amount of equipment.

Reason for this increase is the sturdiness and road-work capabilities of the engine—and the efficiency of tractor operations compared with trucks and trailers. Trucks must be unloaded at receiving docks; tractors can dump their semis, spend an hour in terminal shops for greasing and check-up, and hit the road again in less than an hour. These tractors now get 140,000 to 145,000 miles per year compared with only 96,000-100,000

Injector test bench at Garrett's shops in Pocatello, Idaho.



Soap solution being cleaned off engine block by steam pressure washing prior to reassembly.

miles on truck-trailer rigs. The difference is represented by loading and unloading time—and the lower efficiency of older models, not so well suited for high-altitudes, supercharging was the answer.

After one year's schedule—approximately 140,000 miles—diesel equipment is run into the rebuild shop. It is completely stripped. Rear-ends, transmission, wheels, and the engine is disassembled.

Old engine parts are sent to steam cleaning rooms. From there parts are checked for maximum tolerances—the deciding factor for reuse or installation of new parts. Today 50% more parts are being reused than previously—due largely to better preventive maintenance—which, for Garrett, starts on the road.

One man alone re-assembles the engine. Subassembly is done by specialists. One man grinds engine head valves; others repair fuel pumps, compressors, and rocker assemblies. Average engine rebuild time is 8 to 16 hours. Electrical crews comb the rig, completely replace worn wiring, while other crews replace transmissions, rear ends, and worn parts. Approximately every two years or 280,000 miles a truck or tractor needs a new engine. Five spare engines completely rebuilt or new, stand ready for instant installation.

Garrett's rebuild shops can handle any repair job—no matter how large. It rebuilds wrecked bodies, builds up tractors and truck bodies from the frames—and then paints the entire rig.

A motor comes in for rebuild. It first goes into a stripping room; then parts get a hot soap spray and a steam rinse. Parts are then checked for salvage and a complete motor is rebuilt from sub-assembly to sub-assembly.

Garrett's long experience as a high-altitude operator ironed out a lot of mountain problems which other truckers—and other diesel users—seldom have to worry about. Experience and road breakdowns were Garrett's teachers—a long, slow, and oftentimes costly process. On-the-road maintenance and preventive maintenance have cut breakdowns in half.

Garrett adopted a "Truck Specification Card"—which is kept in each truck and tractor. The Specification Card lists all variances in motor and chassis parts. A typical example is the different piston and sleeve sizes and drive-line lengths which in the past were problems to road call crews, which sometimes had to make two trips for correct parts. Now all the driver need do is consult his chart and phone division headquarters for the correct size.

Preventative maintenance was another factor in reduced road breakdowns. Engines come in for head and rocker assembly changes, in pairs, every 8 months, and heads are changed in the tractor engines every 6 months. Reason for this difference is the versatility of semi-operation over truck-trailer rigs. The semis cover the same number of miles in six months. Total mileage between these head and rocker changes is about 72,000 miles.

Valves and injectors are set at least once a month, or more often for greatest motor efficiency. Rollers and pins in rocker assemblies are checked during every valve and injector service.

Superchargers, though the best equipment for high altitudes, presented Garrett's diesel shop with some problems. Low compression heads and fuel pumps—set for sea level operations—were its greatest worry in early aspirated engines. Fuel pumps, for instance, needed higher CC settings—more fuel for higher altitudes. Shopmen raised the compression ratio from 11-1, to 12.85-1 and have realized 50% greater efficiency.

With installation of blowers, Garrett has been able to maintain air pressures at higher altitudes—as high as 7000 feet. Blowers have maintained horse power efficiency too. But most important, blowers have increased mileage from 3½ to 4½ miles per gallon. Considering a yearly operation of over 11,000,000 line miles, this is a real savings.

Older units, with but 150 h.p. at high altitudes were boosted to 165 h.p. by changing sleeves and pistons. Road time per division—averaging about 250 miles—was cut one to three hours. Fuel costs are from 4½ to 5½ cents per mile. Total maintenance and fuel costs run about 14½ to 15½ cents per mile. When the combined fuel and maintenance costs recah 20 cents the shopmen start to worry—which usually means time for complete engine overhaul.

One of the big problems in changing to higher CC settings and higher compression were burnt air cells. The trouble occurred in the head, where increased compression ratio through high compression heads caused an upset in the balance between compression ratios and air cell capacity. Garrett maintenance men solved this by increasing the compression ratio in the air cells, using longer air cell plugs.

Garrett finds efficiency best in self-contained air compressors, which eliminate high oil pressure from the engine which previously forced its way through compressors, and into brake units.

Fuel oil contamination—especially at high altitudes—has been an ever-present problem. Fuel doesn't burn as clean in mountain work and there is a big loss in power in natural aspirated engines. Supercharging solved this problem—aided better fuel burning and stopped engine suffocation.

Theo Soden, who is general shop foreman at Garrett, and John Banyard, Garrett's motor shop foreman, scoff at the old diesel argument that the more smoke, the more efficiency. They have carried on extensive road experiments that have ended the arguments once and for all.

"Smoke," they say, "is just unburnt fuel—and unburnt fuel means waste." It is just that there is not enough air and because the fuel-air ratio is off somewhere. Give the engine more air—install a blower for instance—and stop waste. Which is exactly what Garrett is doing.

The blower-equipped Buda diesel truck engine.

In changing over to tractors, Garrett has applied the old trucking adage that it takes less energy to pull a load than to carry it. Tractors apply the pulling method: truck and trailers, essentially the carrying method.

Garrett's streamlined repair shops supply main division points with parts—all of them set-up to their standard of operations. Other parts, like drivelines, are bought unfinished, and cut to correct lengths when needed. Its $300,000 Pocatello parts department is as large as many a big-city supply house. When you consider that a truck a day—six days a week—lumbers into the shops for complete overhaul ,and with dozens more in its shops for minor repairs, you can see the reason for large parts inventories—and for the some $50,000 worth of diesel shop equipment.

This year Garrett Freightlines, Inc., expects to gross $7,000,000. 539 pieces of rolling equipment collect freight at main division points in six western states, and send it on its way over 10,000 miles of mainline routes. During 1948, Garrett laid out $11,457 for diesel fuel alone.

Last winter—the coldest in history in some parts of Garrett's long-haul runs, put its diesels to test. At Butte, Montana, with temperatures sinking to more than 50 degrees below zero, drivers had to add alcohol to the fuel to prevent freezing of moisture condensed in the lines. Ether was used to start supercharged engines.

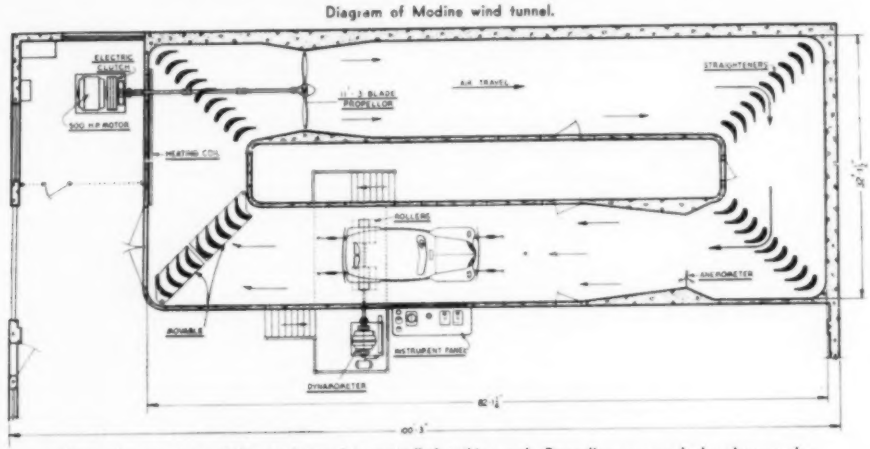
Pioneers like Garrett have had a lot to do with greater efficiency in American diesel circles.

The diesels mentioned in this article are Buda naturally aspirated and supercharged models on which Garrett recently carried out the extensive test program described. The earlier pioneering test program mentioned was carried out on Cummins diesels which are still in service.

AUTOMOTIVE WIND TUNNEL

The eleven foot aircraft propeller which moves tunnel air up to 110 miles per hour.

Diagram of Modine wind tunnel.



The entire operation of the wind tunnel is controlledat this panel. Recordings are made by observers behind one inch, tempered glass windows.

By A. B. ARNOLD*

THE necessity for testing motor vehicle cooling systems is more or less obvious and the methods employed are more or less familiar to most of us. In designing a radiator for a motor vehicle it is, of course, desirable to know the rate of heat rejection to the engine jacket water, the rate of water circulation, the maximum permissible water temperature and maximum air temperature likely to be encountered. With this basic information plus reasonably accurate fan performance data and performance curves for the available radiator cores, it is possible to make a fairly intelligent selection of a radiator and fan which will probably provide adequate cooling. However, space limitations on the available vehicle being what they are, it is highly probable that the fan performance will not be anywhere near theoretical values and consequently total air circulation will be less than expected. Further, the distribution of this air over the total area of the radiator core will not be uniform. In view of these uncertainties, any radiator design based on the data for the various components, that is, engine, fan, and radiator core, must include a liberal factor of safety or, to put it bluntly, a factor of ignorance.

If only one or two vehicles are to be produced, it is probably more economical to apply such a liberal factor than to determine the minimum radiator and fan which would produce the required cooling. However, such a procedure will necessarily result in a system considerably more expensive than the optimum. In the case of mass produced vehicles, it is necessary to have more accurate information which can only be arrived at by testing of the complete combination, in other words, full scale testing of the completed vehicle. In the earlier days this was done on the highway, and such places at Uniontown Hill in Pennsylvania became recognized as a testing ground of sufficient severity. A vehicle which could negotiate this hill without boiling on a reasonably hot day was considered to have good cooling. Road testing, however, involves the disadvantage that accurate comparisons between various combinations of cooling system components are almost impossible to obtain due to changes in wind and weather conditions.

In view of the above considerations, it was decided to build the wind tunnel here described in which it would be possible to conduct road tests of full sized vehicles under laboratory conditions and using instruments of laboratory scope and accuracy. Such a tunnel was designed, built and was placed in operation early in 1941. Since that time a great many vehicles of practically every size and type have been tested. In many cases it has been possible to improve the cooling system of a vehicle and at the same time materially re-

*Chief Engineer, Automotive Division, Modine Mfg. Co., Racine, Wis.

duce the cost of the radiator that is required.

The general arrangement of the tunnel is shown in the accompanying plan view. Cross section of the tunnel, 12′ 6″ wide and 11′ high, is sufficient to accommodate almost any motor vehicle.

As indicated by the diagram, the tunnel is a closed circuit in which the vehicle is mounted and completely enveloped, top, bottom and sides, in the stream of moving air. This condition is believed to be absolutely necessary for present-day vehicles with radiators buried in the body or even mounted at sides or rear. In some cases the aspirating effect of the air stream under the car may be as important as the pressure on the radiator grille in causing air flow through the radiator.

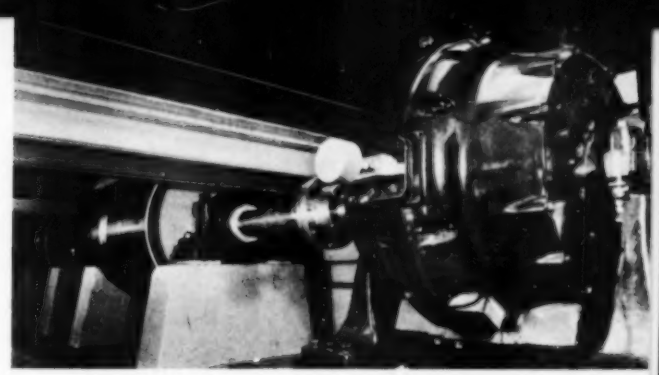
Air circulation in the tunnel is by means of an 11-ft. diameter, three-blade, airplane-type metal propeller, driven by a 500-hp. 4000-volt, constant speed, A.C. motor with flexibility of control obtained by driving through an eddy current clutch.

The velocity of the air stream can be adjusted to any speed from 3 to 125 m.p.h. and maintained within plus or minus ½ m.p.h. This range covers all types of vehicles from heavy duty trucks operating in low gear to passenger cars in overdrive.

Tail wind conditions are obtained by setting the air speed at the required number of miles per hour below the vehicle speed.

Ventilation provided is sufficient to maintain tunnel temperatures within 10 deg. of outside temperatures when testing an average sized vehicle. Tunnel temperature can be increased when desired by reducing ventilation and by means of auxiliary heating equipment. Since this tunnel was designed for testing cooling systems, low temperatures are not required.

Power developed by the vehicle is taken off the drive wheels on revolving steel drums or rollers



Dynamometer connected directly to drums on which vehicle wheels rest. It can absorb up to 700-hp.

—dynamically balanced and designed for loads up to 20,000 lb. each. These drums are exactly 8.8 ft. in circumference, so that 10 r.p.m. of drum equals 1 m.p.h. The same instrument can, therefore, be used for measuring dynamometer r.p.m. and vehicle speed in m.p.h.

The power is absorbed by an electric dynamometer, which can be controlled to take the vehicle's full power at any speed or throttle setting, or can hold the vehicle to any desired speed under wide open throttle. Dynamometer capacity ranges from 700 hp. at 85 m.p.h. down through 105 hp. at 15 m.p.h. to 0 hp. at 0 m.p.h. This is sufficient to take the full engine horsepower of any road vehicle being built today.

For cooling system tests, low gear conditions on heavy trucks are obtained by operating the engine at the desired speed and load in high gear, with air speed adjusted to correspond to low gear vehicle speed. For example, an engine operating at 1000 r.p.m. at wide open throttle, in high gear with an air speed of 3 m.p.h., will cool exactly the same as it would in low gear at the same r.p.m., throttle wide open, and a road speed of 3 m.p.h. This method of running low gear tests has the added advantage of reducing the torque transmitted by the drive wheels.

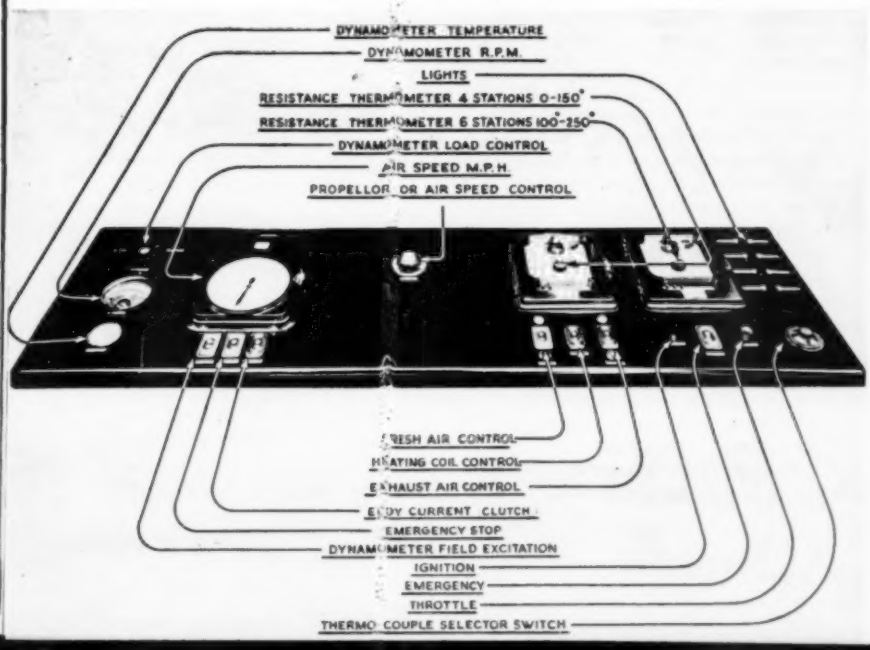
The test is conducted entirely at the control panel by the operator, who has at his fingertips all controls necessary for adjustment of air speed, air temperature, and dynamometer load, as well as throttle adjustment for the vehicle under test. There is also an ignition switch which permits the operator to stop the engine at any time. No driver is required. Temperature measurements in the cooling system are taken with multiple-station resistance thermometers with an accuracy of ½ deg. Fahr.

This wind tunnel has been in almost continuous operation since it was first placed in service in the spring of 1941. Vehicles tested range from small tractors through passenger cars and trucks to interurban buses and the largest military wheeled vehicles. Development and testing of air conditioners for passenger cars and buses has also been carried on in the wind tunnel.

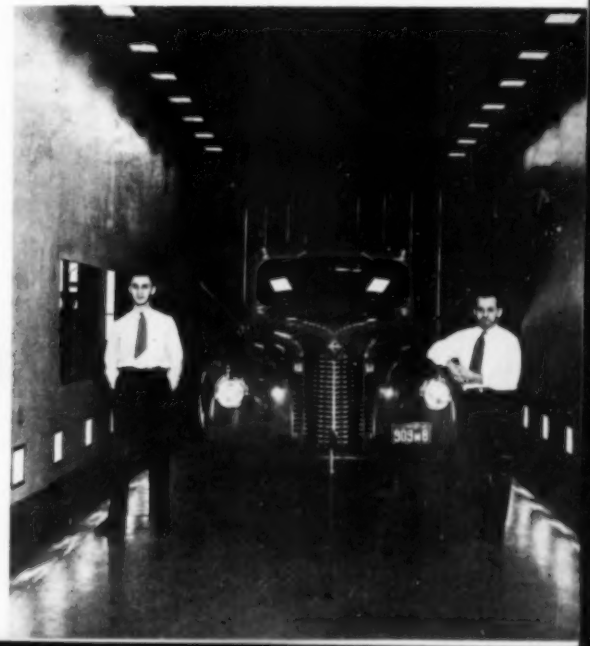
Experience has been most satisfactory and has shown that tests can be conducted with far more consistent results and also in much less time than is possible under even the most favorable outside test conditions. As an independently owned and operated wind tunnel, it has a special significance to the many manufacturers of internal combustion engines who have access to no comparable facilities in this country.

The wind tunnel described in this article was built and is operated by the Modine Manufacturing Company, Racine, Wisconsin.

Close-up detail of control panel.

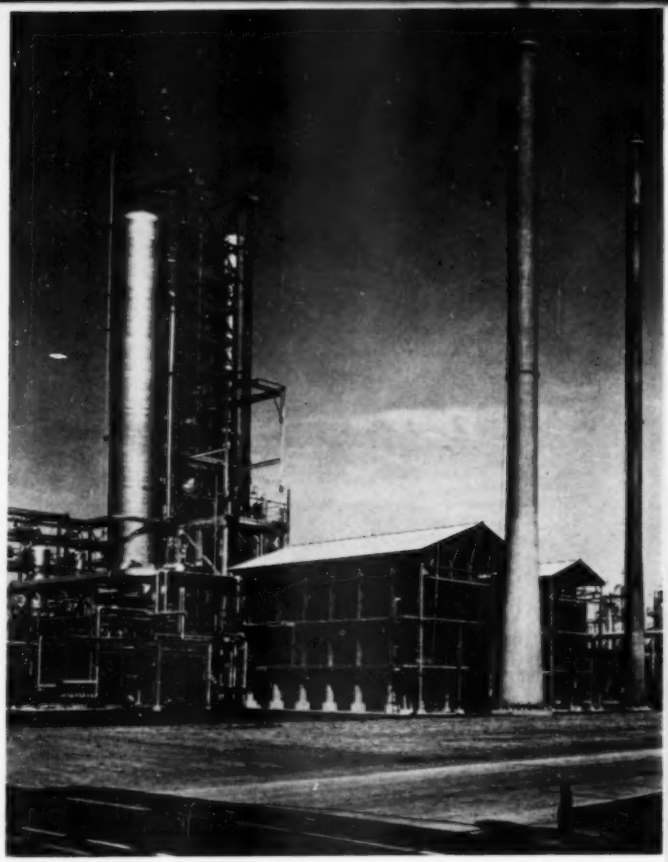


International Harvester truck photographed between tests.



EVALUATION AND APPLICATION OF DIESEL LUBE OILS

By ALBERT E. HICKEL*



Lubricating Oil Plant, Shell Oil Company, Houston, Texas.
Photograph Courtesy of Shell Photo Library

TESTS have shown that internal combustion engines are sensitive to excessive wear of pistons, piston rings and cylinder liners. However, cylnider wear of about two to four thousandth of an inch per thousand hours of operation is considered normal. Sticky deposits from unburned fuel and partially burned lubricating oil, will cause piston ring sticking, while other conditions favor low temperature sludge which is due to operating the engine at temperatures below the dew point of Products of Combustion. Types of sludges developed during operation of engine are classified into:—Oil-Carbon Sludge; Oil-Tar Sludge; and Emulsion Sludge. These sludges can be controlled by regulating the oil temperatures, such as increasing the volume of oil in the sump; using a less viscous oil; or by means of an oil cooler, thereby reducing the amount of oil-tar sludge and increasing the amount of oil-emulsion sludge. This however, can be controlled by increasing the jacket temperature. Crankcase ventilation also assists in cooling the oil and by removing any water vapors that might be present, thus reducing the formation of oil emulsion sludge. To minimize "low" temperature sludge it is important that the jacket water temperature is at least 75 deg. F. before the engine is started, and to warm up the engine before putting on a load. "High" temperature sludge differs from "low" temperature sludge in that it is composed of crankcase oil thickened with oxidation and thermal decomposition products.

Lubricating Oil Characteristics

Many of the characteristics of fuel oils are also applicable to lubricating oils. Certain additional qualities are desirable, such as: Oxidation resistance, corrosion resistance, detergency, dispersion, foam stability, extreme pressure characteristics, reaction with water, homogenity, compatability.

Heavy-Duty Detergent Type Oils

Engine operating at high loads, high speeds, and high temperatures require detergent-type lubricating oils. During the combustion of fuel in a diesel engine, deposits are formed consisting of gummy residues and soot. In addition, decomposition of the lubricating oil reaching the rings is also influenced by this combustion process. These gummy residues act as binders for the fuel soot and build up sticky deposits on the ring lands and in the ring grooves. The chemicals usually used are of the mettalo-organic compound types to provide a cleaning and dissolving action on the previously formed deposits in used engines and prevent the redeposition of these deposits, i.e. they peptize the sludge particles and prevent coagulation, such as calcium and barium sulfonates. An oil of this type when used in new engines will greatly minimize initial deposition of such deposits. Engines that show a tendency to "ring" sticking or "varnish" require these heavy-duty lubricating oils for power cylinder lubrication. These oils usually prove detrimental though, if used as a crankcase lubricant in large stationary engines. However, where oil temperatures in engines run abnormally high (190°F. and over), such oils have been employed as crankcase lubricants.

Heavy-duty oils are oils containing special additives which improve the oxidation resistance of the oil and give it special cleansing qualities. Oxidation inhibitors and corrosion precentives (Alloy Bearings) constitute mostly sulfur, phosphorous and nitrogen for the purpose of preventing bearing corrosion, varnish and sludging. Now, however, anti-foam additives such as, approximately 1% of a silicone oil are added to certain oils, in addition to above oxidation resistance and rust preventive additives. On diesel engines employing air injection compressors, specially compounded oils for air compressor lubrication should be used to lubricate the compressor. Such oils must have high oxidation resistance and leave a minimum of carbon deposit. Any small amount of moisture that condenses from the air is carried into one or another of the compressor cylinders is taken care of by this compounded oil, otherwise this water has an adverse effect on lubrication, and can also cause rusting of the valves, cylinders, piston rings, etc. Excessive quantities of metallic particles found in the lubricating oil usually indicates rapid wear.

Dispersion Characteristics

Dispersion in an oil is that characteristic which maintains finely divided, insoluble particles suspended in the oil. However, a certain time limit is essential for renewal of the oil, otherwise the oil becomes overloaded with these finely dispersed contaminants. Extreme Pressure Additives (Break-in properties) usually are of the halogen, sulfur, nitrogen and phosphorous types. They reduce engine wear and prevent scuffing. Rust Preventives are of the amines and fatty acid type, to prevent rust in new engines during storage or shipment. They assist the wetting action of the oil by lowering the surface tension of the oil, and have great affinity for most metals.

Oxidation Inhibitors

Improvement in oxidation resistance of the straight mineral type engine oil, as determined by corrosiveness of the alloy type bearing, was attained by the use of chemical compounds or additives (oxidation inhibitors). The development of engine oils with high resistance to oxidation was furthered by the advent of the General Motors 2-cycle diesel engine and its adoption to bus, truck and tractor service. This engine employing oil-cooled pistons and copper-lead bearings required an oxidation-resistant oil.

* *Consulting Lubrication Engineer, Denton, Maryland.*

THERMO COUPLE SELECTOR SWITCH

Bearing Failures

Bearing failures are usually due to mechanical failure or oil corrosion. Oil corrosion failures are due to lack of oil stability and contaminants from combustion chamber by-products, as well as from moisture accumulation in the crankcase. Control of engine bearing temperatures is an important function, either by means of the cooling effect of the oil or rate of flow over the bearing surface and by proper clearances.

Classes of Additives

Two classes of additives are used: 1) Inhibitors with little or no detergency, for use either alone or in conjunction with detergent additives. 2) Inhibitor-detergents, which offer a balanced effect in controlling oxidation and bearing corrosion and in controlling engine deposits.

Additives

Small quantities of various oil soluble compounds are added to lubricating oils in order to impart characteristics which are not obtainable through the refining process. These compounds are of several types, each designed to perform a certain job, such as:

1) Oxidation Inhibitors, to prevent sludge, varnish and bearing corrosion.
2) Detergents, to keep engine surfaces clean.
3) Dispersants, to keep potential sludge deposits in suspension.
4) Anti-foam agents, to prevent excessive foaming in high speed engines.
5) Extreme pressure agents, to reduce engine wear and to prevent scuffing by forming a lubricating film which prevents metal-to-metal contact.
6) Pour Depressants, to reduce the cloud and pour points of the oil.
7) Rust Preventives, to overcome corrosion.
8) Viscosity Index Improvers, to improve quality of the oil, by preventing excessive viscosity changes with temperature fluctuations.

Small percentages and proper combination of these additives will increase not only the oiliness or affinity for the metals, but will increase the film strength of the lubricant and its heat resisting properties. Blow-by with such an oil will be held to a minimum, thereby causing less dilution and contamination of the oil in the crankcase, resulting in longer life of the lubricant. Lubricating oils to be used in cold climates, should have low pour points and be fairly free from wax, to prevent "pour reversion." However, the newer pour point depressants show high resistance to pour reversion. High cloud and pour points in an oil are due to wax in some form.

Heavy-Duty Diesel Lubricants

Some of the new super-heavy duty Caterpillar diesel engines require the Series 2 oils, having greater percentages of additives, approximately 15 to 20%, but greater amounts of additives alone will not produce a satisfactory oil. The refining process, compounding and crude sources have also to be considered, as it has been found that oils that produce low wear do not always produce clean engines, and oils that produce clean engines do not always produce low wear. The proper balancing of additive compounds in an oil is necessary to produce best results in actual service. Apparently this type of oil has a great advantage in any Caterpillar diesel engine, especially for the supercharged diesel or in unsupercharged when high sulfur fuels are used, while the regular diesel oils require only about 5% of detergent additive to meet the 2-104B, U. S. Army Specification approval. These 2-104B oils must meet the Caterpillar single cylinder test and a Chevrolet engine test, before they are approved. Some of the more important tests used in evaluating diesel lubricating oils are as follows:

Foam Test

The tendency of some heavy-duty detergent type engine oils to foam during service occurred wherever the oil was agitated with excessive quantities of air such as exists at the scavenging pump in the oil system of radial aircraft engines. The foam test is made as follows:—

Heat a quantity of the oil under test to 75°F. for the SAE. 10, 20 and 30 grades, and 120°F. for the SAE. 40, 50 and 60 grades. The heated oil is then stirred for three minutes with an electrically driven household mixer equipped with round paddles and operating at 980 to 1,000 rpm. Immediately following this stirring, the oil is poured into a glass graduate. With the test temperature being maintained, the volume of oil plus foam as well as the volume of clear oil is observed every ten minutes for a period of 60 minutes. The volume of foam is determined as the difference between these readings. A 500 c.c. graduate is used for the above test. It should be understood that practically all oils of the same viscosity haxe approximately the same amount of foam at 0 minutes or immediately after stirring. It is the rapidity with which the foam breaks that determines a non-foaming oil.

The Aleman Test

This test is used to compare and evaluate "film strength."

Ordinary motor oil (low E.P. quality) ..... 6 to 8 lbs.
Hy-Duty detergent type oil (high E.P.) .....20 to 30 lbs.

Other laboratory performance tests besides the usual tests on heavy-duty oils include other well-known oxidation tests; thermal stability; emulsion; compatability with existing products, competitive products and used oils; effect of fuel dilution; storage stability; effect of water contamination; effect of various oil filters; reclaiming and other tests.

Caterpillar Single Cylinder Test

A lubricant, to be designated as a superior lubricant for this type of diesel engine, must possess all of the following qualifications as determined by full scale engine operating tests:—

A—prevent ring sticking.
B—form a minimum of deposits on the liner, piston and rings.
C—be non-corrosive to bearings, filters and other engine parts.
D—show high resistance to scratching of rings and cylinder liners.
E—show low cylinder liner and ring wear.
F—insure open oil channels and free acting oil controls.

To meet these tests, a special type of single cylinder diesel test engine (5¼ in. by 8 in.) has been developed for laboratory use. Another, specially equipped four-cylinder diesel test engine with a bore and stroke of 4½ in. by 5½ in. is also used for determining the ability of the oil to meet qualification C.

Chemical Changes in Diesel Oils

Conditions involved in engine operation cause all known lubricants to deteriate in service, high temperatures and pressures of diesels make the action much faster. Acid reaction products formed due to oxidation, are also blamed by some for varnish deposits on pistons, valve stems and other metal parts. Metallic oxides, which accumulate in the lubricant in service, act as powerful catalysts and hasten the oil's deterioration. Diesel oils have to be refined with suitable physical characteristics and, even more important desired chemical characteristics.

Oil Combustion and Viscosity Index Improvers

Viscosity is important and an oil thickened with a V.I. Improver will show some improvement in consumption, but volatility of the base oil is also important in regard to clean engines. Viscosity Index Improvers are usually polymers suitable for the respective lubricating oils in which they are used. These high molecular weight polymers increase the viscosity of the oil, especially at the higher temperatures. They produce a blend that changes less in viscosity between hot and cold. For best results, the amount required usually is between 2.8 to 3.8%. In selecting lubricating oil maintenance equipment, such as filters, careful consdieration should be given to the type of filter for the specific oil that is used in the engine. If heavy-duty or additive oils are used, the filtering medium must be non-absorbent. Cotton waste has proven quite satisfactory for both straight mineral oil and additive type oils.

Railroad Diesel Engines

Railroad diesel lubrication has gone over to detergent-type additives with very good results. The coming of the high-speed diesel, along with supercharging, brought entirely new lubrication problems and a new conception of adequate lubrication and lubricating oil maintenance. Higher operating temperatures, higher bearing pressures, and higher piston speeds created a more rapid and critical contamination of oil due to oxidation, the formation of acids, blow-by and excessive carbon formation, all of which deteriated the value of the oils.

Marine Diesel Oils

The smaller marine diesel engines, both 2 and 4 cycle, require compounded oils with heavy-duty detergency and oxidation, SAE. 30 grade. The larger marine diesels, require mostly a non-additive, SAE. 30 and 40 oils.

"MARY E. PETRICH" WORLD'S LARGEST

By CHARLES F. A. MANN

NAMED for the kindly, enthusiastic, energetic wife of Marian Petrich, Sr., and mother of the five Petrich boys, all but one of whom is with the family shipyard, Mrs. Mary E. Petrich, the world's largest tuna clipper MARY E. PETRICH headed south late in July to join what may be the last big California tuna fishing spree before the scene shifts abruptly from the Southern California area to the Gulf of Mexico.

The late Mrs. Petrich inspired and raised her family over 40 years, and did not live to see the greatest product of the family shipyard, and the greatest family investment, become more than a dream on a paper. The MARY E. was not only built and outfitted by the Petrich family, but this $600,000 investment is solely owned by them and will be operated along with five other jointly owned Clippers out of California, and managed by Hervey Petrich, oldest son, who tends the family's financial interests in the South.

Constructed of traditional Douglas fir, in more than careful manner—the builders and workmen had a job to do to commemorate the memory of the vessel's namesake—the MARY E. PETRICH, is one of the finest designed Clippers afloat, and with every mechanical and layout refinement, plenty of welded steel, mahogany trim and novel money saving ideas built in by designer Jim Petrich, who has played the lead role in the company's Western Fairliner pleasure boat line. The heavy planked hull is big enough for a 450 ton Tuna load, but unlike most of her sister ships, has the graceful unclipper like lines of a swift merchant ship, even to streamlining the stern, yet preserving the wide square deck and railing effect necessary for operation. The hull has 7 in. flitches spaced on 24 in. centers and 2¾ in. planking. The fish wells are all steel, cork insulated. Mahogany trim in all quarters; aluminum stack and crows nest—the crows nest on a Clipper is as vital as the rudder and the real "eyes" of the ship.

Principle dimensions are as follows:

Length overall	150 feet
Length between perpendiculars	140 feet.
Beam	34 feet.
Depth	16 feet.
Gross tonnage	509.44
Net tonnage	263.11
Loaded speed (Max.)	13¾ knots
Capacity of frozen tuna	450 tons
Fuel oil (Inc. 2 convertible fish-wells)	68,000 gals.
Lube oil	2,000 gals.
Fresh water	5,000 gallons
Gasoline (For tenders)	500 gallons

The fourteen fishwells, three on each side, which are for use outbound with fuel oil and inbound as refrigerated holds for tuna, plus the 3 compartment bait box, gives her a relatively large capacity for both a tremendous cruising range (20,000 miles) and a large, profit-earning homebound tuna capacity in fish storage space.

The pilot house and captain's quarters for skipper Joe Alves, and the radio shack are atop, with curved windscreen on the forward deck. The pilot house has full engine room controls; fathometer, steering gear, full ships intercom set including a unit in the crows nest; direction finder and plenty of room to move around it. The five exhaust silencers are located in the streamlined dummy stack aft, along with motored ventilating fan.

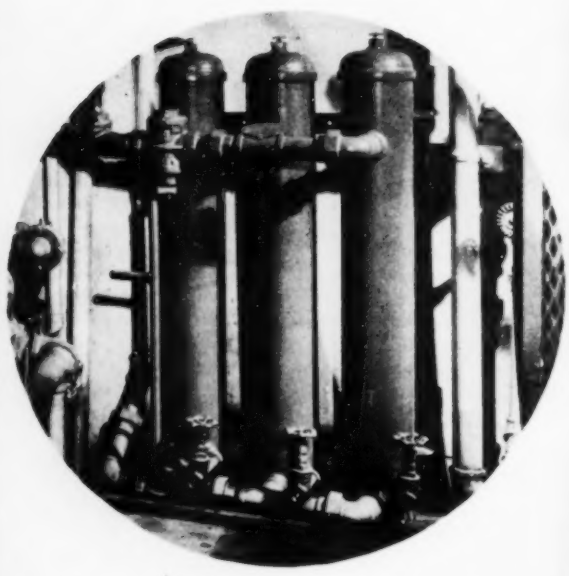
Engineers and crews quarters are carried for a total including the captain's and radioman's quarters on top, for 20 men, all on the upper main deck, where light and ventilation is excellent.

The main deck starts off with stores far forward, a very large machinery flat with full repair facilities and the battery ice machines.

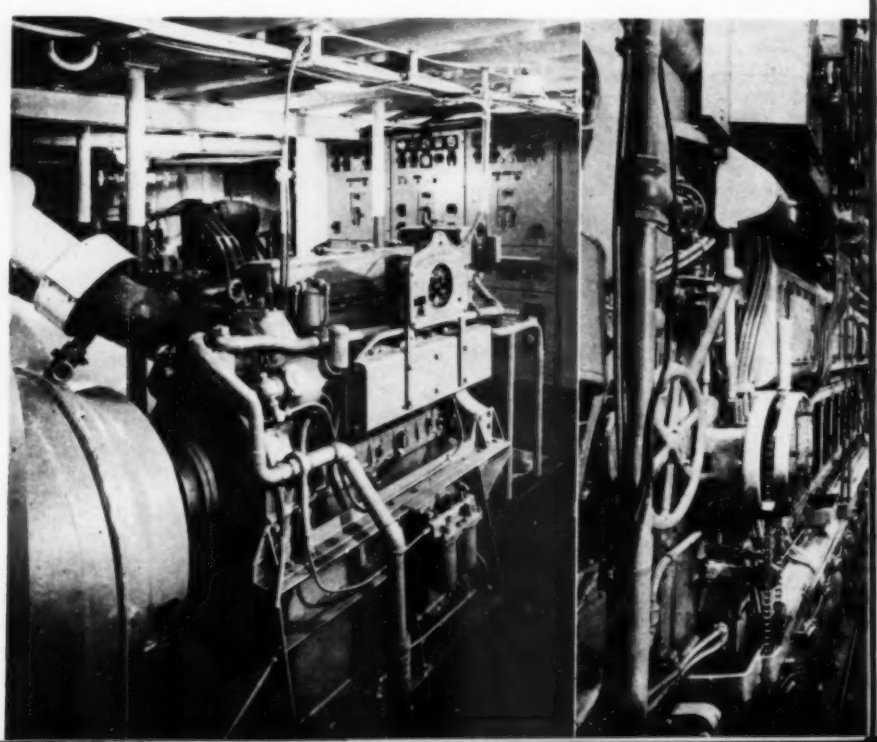
Also mounted on the upper machinery flat is the upper generating set consisting of a 100 hp. 6 cylinder diesel and a 60 kw. F.M. alternator, for premlinary starting up, lights and compressors, and a very limited refrigeration or pumping load.

Aft of this space is the large galley, with toilet facilities and cooks stateroom adjoining. Large working spaces and an electric galley range including surface grill unit, radio loudspeakers; intercom units, give the whole galley a club-cruiser atmosphere for the entire crew at a single sitting.

Three Engine Life Products' 6-in. fuel filters.



General Motors 100 hp emergency diesel-generator set on upper machinery flat of "Mary E. Petrich" engine room.



DIESEL TUNA CLIPPER

PETRICH

Second from right: Martin Petrich Sr., president of Western Boat after whose late wife the "Mary E. Petrich" was named, and three of his sons.

if the need arises to serve all at one time.

Main propulsion consists of a 1600 hp. diesel, with cylinder dimensions of 8½ x 10 in. This drives through a governor and pilot house as well as engine room controls, a hydraulic coupling. From this coupling runs a unique monel metal tailshaft, 8¾ in. in diameter and 24 ft. long, the largest monel tailshaft ever built for a fishing vessel. At the end of this shaft is the planetary type reduction gear, with a 3 to 1 reduction in speed between the engine shaft to the short, heavy tailshaft that swings a 107 x 82 in. propeller.

At full speed at 720 rpm. the smooth, quiet, vibration free diesel drives the vessel close to 14 knots, the fastest tuna clipper in the world. On the non-stop run from Tacoma to San Diego in little more than three days, the big vessel performed like the proverbial Swiss watch, with no trouble at all, and the fastest non-stop run down the Coast by a fishing vessel, in the history of tuna clippers.

Auxiliary power consists of two 210 hp. large size, heavy duty diesels driving at 720 rpm. a 178 kvs. 3 phase, 60 cycle, 480 volt alternator. These twin units give the ship the conventional 440–220–110 volt power, enabling the use of high efficiency, compact AC motors, simple controls, light gauge wiring and direct ship to shore plug in and instant shutdown of the auxiliary plant. A 3 kw. DC generator for certain navigation equipment is fitted on the auxiliaries. A 5 kw. motor generator set for the steering system is also fitted. The main switchboard is a large, many circuit installation.

The main engine is equipped with lube oil coolers and heat exchangers in the fresh water cooling circuit, both valve controlled.

Oil transfer pump and a fuel oil filter are some other equipment items.

In addition to lube oil filters throughout the ship, she carries a three unit fuel filter system, equipped with a three way valve. The installation consists of three 6 in. diameter units 44 in. high, connected by manifolds and valves to permit alternate use for changeouts of the replaceable elements in each unit. This cleans and dewaters the fuel oil increasing engine life and protecting the injection pumps.

The auxiliary diesels are similarly equipped and carry lube and cooling water heat exchangers and oil strainers. A 5 hp fire pump, bilge and sanitary pumps, two 7½ hp. motored compressors, 14 combination bait and brine pumps powered by 7½ hp. motors, all mounted in the shaft alley, a unique feature which eliminates duplicate pump installations including the large bait water circulating pumps. Ten 50 lb. CO_2 fire extinguisher bottles are manifolded for protecting the machinery spaces plus six 15 portable CO_2 units. A battery charger unit and three 15 kw. transformers are carried.

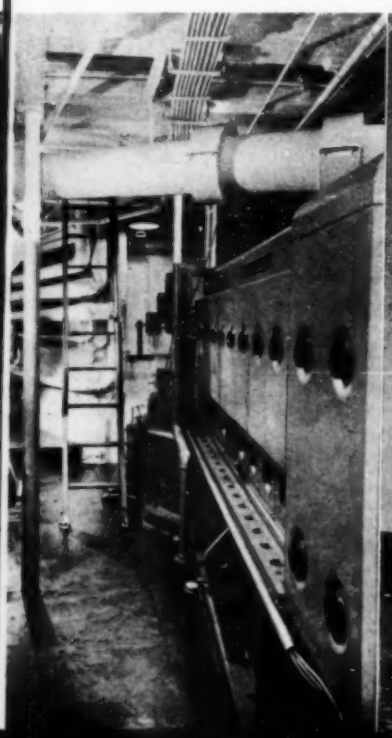
It is easy to understand why this vessel represents over $550,000 investment cost. With her speed and large capacity, a normal lucky season should bring fairly high returns even with tuna dropping to the $300 per ton level.

Captain Joe Alves will skipper this ship for the Petrich family and Jack Silva is Chief Engineer, both experienced fine men, highly regarded in the giant tuna industry of San Diego. Representing the family in Southern California will of course be by senior son Hervey Petrich, stationed in San Pedro, California.

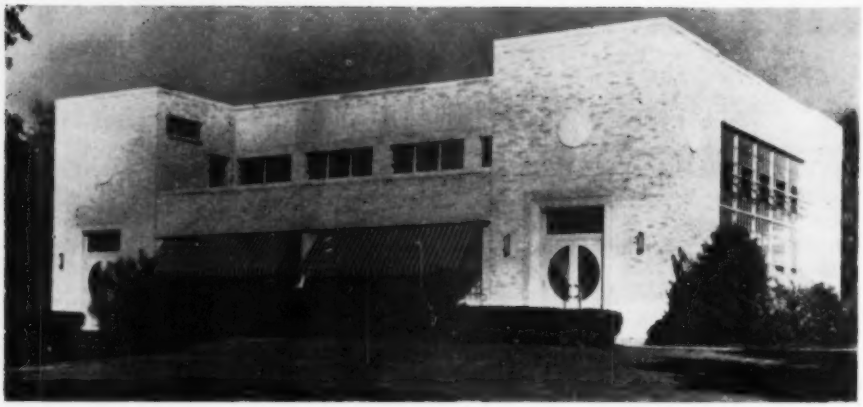
Principal Equipment

Main and auxiliary diesels—Fairbanks-Morse.
Diesel-generating set—General Motors.
Intake and exhaust snubbers—Burgess-Manning.
Lube oil filters—Purolator Products, Inc.
Lube oil pumps—Viking Pump Co.
Lube oil coolers—Ross Heater and Mfg. Co.
Heat Exchangers—Ross Heater and Mfg. Co.
Fuel oil filter—Commercial Filter Corp.
Oil Strainers—Cuno Engineering Corp.
Hydraulic Coupling—American Blower Corp.
Planetary Reduction Gear—Western Gear Works.
Compressors—Quincy Compressor Co.
Pneumatic Engine Brake—Fawick Airflex Co.
Ice Machines—Baker Ice Machine Co., Inc.
Portable CO_2 units—Walter Kidde and Company.
Steering Gear—Sperry Gyroscope Company.

Left: one of the Fairbanks-Morse 210-hp. auxiliary diesels. Right: Main Fairbanks-Morse 1600-hp. O.P. diesel.



"Mary E. Petrich" on trials.



Municipal power plant, Osage, Iowa. To maintain clean-out building appearance, exhaust snubbers and air filters are housed in basement chambers.

OSAGE, IOWA: A 7-YEAR REPORT

Midwest Show-Plant Figures Tell Of Operating Success

By WILLIAM H. GOTTLIEB

WHEN Osage, Iowa, put its municipal power plant into service in 1942, it was clear that this was destined to be a show-place of the Midwest, a public building of which the citizens could be proud. Six years of operation have demonstrated conclusively that this plant can match its impressive appearance with an equally impressive record of efficient and economical power production. In that time, the three 730-hp. diesels have operated 80,505 engine hours and generated 24,011,350 kw. hr. Despite an operating engine load factor of less than 60 percent, these normally-aspirated engines produced 13.45 kw. hr. per gal. of fuel consumed during this period.

The citizens of Osage (3,200 in the 1940 census) determined to build their own electric system because of high rates and frequent service interruptions. The first essential they demanded in their power plant was dependable performance year after year. The engines are three identical 5-cylinder, 4-cycle, mechanical-injection diesels, each rated at 730 hp. at 257 r.p.m. Each engine drives directly a 500-kw., 3-phase, 60-cycle, 2300 volt generator with 15-kw. chain-driven exciter. Six years are scarcely more than a break-in period for heavy-duty diesels like these but the citizens know already that they are getting what they ordered—there has not been a single service interruption due to engine failure.

The second essential Osage asked of a power plant was efficient power production that would permit moderation of the prevailing high consumer rates. We cited above one of the common yardsticks for measuring diesel performance: kw. hr. per gal. of fuel, noting that the seven-year average was an excellent 13.52. Actually, the best year on record is the most recent for which figures are available, the fiscal year ending March 31, 1949, in which the plant produced 4,447,600 kw. hr. while consuming 320,578 gal. of fuel, an average of 13.87 kw. hr. per gal. This was achieved with an average operating engine load factor of 63.0 percent. Lubricating oil economy has been equally notable. In the entire seven years of operation, the plant consumed just 9,117 gal. of lube.

This means an average of 6,446 hp. hr. per gal. of lube. Table I gives a year-by-year picture of kw. hr. generated, fuel and lube consumed, engine hours and load factor.

Expressed in terms of operating costs, this performance means an average fuel cost for the seven years of only $.0057 and an infinitesmal lube cost of $.00032 per kw. hr. Of course fuel prices have been high in recent years, but even in 1948-49, at the peak of the inflationary spiral, total plant operating costs (including fuel, lube, labor, maintenance and repair, supplies and miscellaneous expenses) totalled $.0128 per kw. hr. The seven-year average for total plant operating was $.01002 per kw. hr. Indications are that the inflation has passed its peak and plant management has taken positive action to reduce the cost of fuel, so it is anticipated that operating totals will be lower in the coming year.

Operating economy has made possible the fulfillment of the second main objective. The rate schedule put into effect when the plant was put to work work was substantially lower than rates the citizens had paid the private utility. Even these charges have been further reduced.

In seven years, the municipal electric department has had revenues of $676,532.70. Spending $240,707.86 for operating the plant, another $88,175.67

Table I

Year Ending Mar. 31	Kw. Hr. Generated	Fuel Consumed (Gal.)	Kw. Hr. per Gal. Fuel	Lube Oil (Gal.)	Engine Hours	Load Factor (%)
1943	2,744,650	207,871	13.38	982	9,868	56.3
1944	2,781,400	204,525	13.60	1,364	8,950	61.9
1945	3,148,900	235,705	13.37	673	10,257	61.3
1946	3,075,800	235,731	13.06	733	10,608	57.8
1947	3,704,200	275,485	13.44	1,713	13,154	55.9
1948	4,078,800	295,041	13.84	1,738	13,684	59.3
1949	4,447,600	320,578	13.87	1,914	13,984	63.0
Totals	24,011,350	1,744,936	13.52	9,117	80,505	

Table II

Year Ending Mar. 31	Total Revenue $	Cost of lant Operatir $.	Cost of Dist., Admin., etc. $	Elec. Dept., Int. Deprec. $	Net Profit $
1943	78,906.26	19,132.15	9,785.28	26,514.02	23,474.81
1944	86,851.04	21,221.96	8,771.02	22,877.64	33,980.42
1945	85,966.24	25,849.56	10,389.72	22,479.57	27,247.39
1946	89,366.30	34,565.50	10,543.64	21,708.89	22,548.27
1947	104,599.85	40,212.82	13,570.58	20,603.66	30,212.79
1948	111.339.85	42,711.21	14,960.23	20,863.35	32,804.56
1949	119,503.16	57,014.66	20,155.20	18,700.07	23,633.23
Totals	676,532.70	240,707.86	88,175.67	153,747.70	193,901.47

for the distribution department, administration, accounting and collecting, and allocating $155,747.70 to interest and depreciation, the department cleared a net profit of $193,901.47. Table II gives annual figures on revenues, costs and profits and it will be observed that increased consumption of electricity at the lower rates brought revenues to record levels in 1948-49 and, in spite of higher operating costs, profits came to a tidy $23,633.23.

A combination of good prime movers, good accessory equipment, and sound operating practice has been the foundation for Osage's financial success. Supt. L. J. Lamprecht has sought to counteract high fuel prices by using one car of Texas crude oil with every two cars of gas-oil. Fuel is unloaded into a 19,500-gal. tank above ground near the railroad track, then transferred and blended in two underground tanks of equal capacity near the plant. The crude is put through a filter with fuller's earth filtration elements. A motor-driven pump handles the fuel transfer; individual motor-driven pumps for each engine send fuel from storage to the day tanks in the plant basement. These pumps are controlled by floats in the day tanks. There is also a filter on each engine. Every effort is made to keep lubricating oil in good condition. The lube oil is bypassed continuously through a filter for each engine. A motor-driven pump draws oil from the engine sump tank, puts it through the cellulose filtration elements and then back to the tank. Every 500 engine hours, the lube is drained to another tank and put through a reclaimer where fuller's earth filtration and vaporizing effectively remove moisture, fuel dilution, tars, acids and other contaminants. Each engine is provided with a lube oil cooler. Lubricating results have justified the care and equipment employed to condition the lube. First, of course, there is the record of 6,446 hp. hr. per gal. of lube, but more important is the condition of the engines themselves. In the regular overhauls every 8,000 hours, Osage operators have never found a stuck ring. Cylinder wear is small and bearing wear negligible.

Three evaporative coolers give the plant a flexible cooling system for any combination of the coolers can be used on whatever engines are in service. Automatic thermostatic controls regulate the cooler shutters and also the pumps that spray water over the coils. Water treated in a softener to obviate deposit of scale is pumped through the engine jackets and cooler coils by three motor-driven centrifugal pumps.

There is nothing visible from the exterior of the building to indicate that this is a power plant. The oil bath air filters are housed in a basement chamber on the east end of the plant, while the exhaust snubbers are in a similar chamber on the west side. This arrangement is useful in heating the plant, for motor-driven fans send warm air from the exhaust chamber through ducts to all parts of the building except the offices. The offices are heated by radiators hooked into the engine cooling water system.

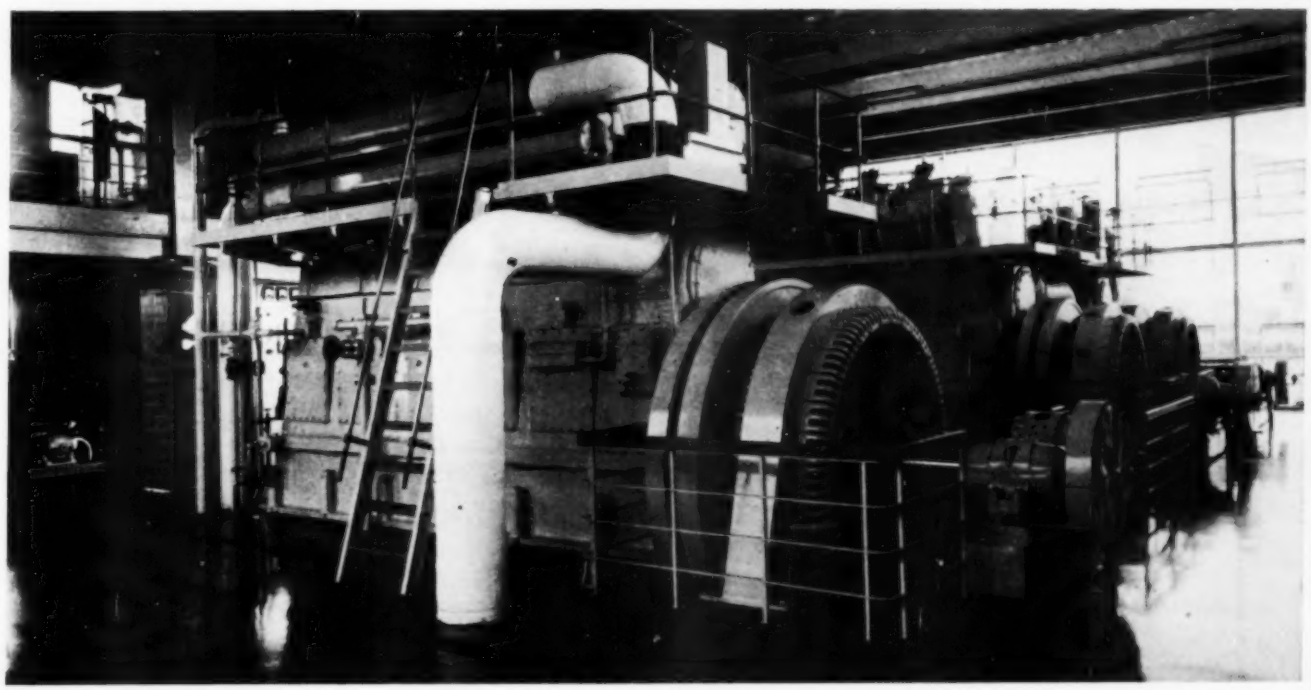
There was never any question of the attractiveness of the Osage plant with its light brick and stone exterior. Its setting of broad green lawns with trees and shrubs is part of a 17-acre tract which has been turned over to the city for development as a recreational area which will include an athletic field, swimming pool and park. After more than six years of operation, there is no question of the plant's qualities as a power producer. The figures tell the story.

The electric department is run by Superintendent Lamprecht with the supervision and close cooperation of a board of trustees consisting of Chairman George L. Schwenneker, Ben A. Chatman and Walter E. McCoy. The trustees are chosen for six-year terms by the mayor and city council.

EQUIPMENT

Fulton diesel-generator sets-
730-hp. at 257 rpm.
Generators: Elliott 500-kw, 3-phase, 60-cycle, volts with 15-kw chain drive exciter.
Fairbanks-Morse evaporative coolers.
Marlo evaporative coolers.
Ross lube oil coolers.
Hilco lube oil filters.
Hilco fuel filters.
DeLaval centrifugal water pumps.
Graver water softener.
Viking fuel pumps.
Burgess exhaust snubbers.
Air Maze air filters.
Gardner-Denver air compressor.

General view of engine room at Osage.



COOPERATIVE ELECTRIC POWER IN RURAL FLORIDA SECTION

By FRANK AIRTH

MANY people considered there was nothing around Keystone Heights, Florida, to support a power plant there being only a few even smaller villages and a number of scattered farms in the region. Nevertheless, the CLAY ELECTRIC CO-OPERATIVE was organized around the small 30 KW and 60 KW generator sets of the municipal power plant. With 400 prospective consumers in sight, two engines with 150 KW generators were ordered and installed in 1939 when the co-op started to supply electricity.

Right away there was insufficient power to satisfy the demand, so two Cooper-Bessemer, 475 KW generator sets were installed, one in 1940 and another in 1941. The 30 KW and 60 KW sets were disposed of as being too small, and with the plant manager, Mr. Pat Loudin's drive for area coverage, the plant had to grow fast to keep up with the demand. During the war, power had to be bought as the 400 original consumers had enormously increased, so three more Cooper-Bessemer, 1450 h.p., Elliott-Buchi turbocharged engine-geenrators were ordered. The first of these, hooked up to a temporary switchboard, operated almost continuously for eight months from November 1946; the permanent switchboard was completed just prior to the installation of the second and third engines in August 1947.

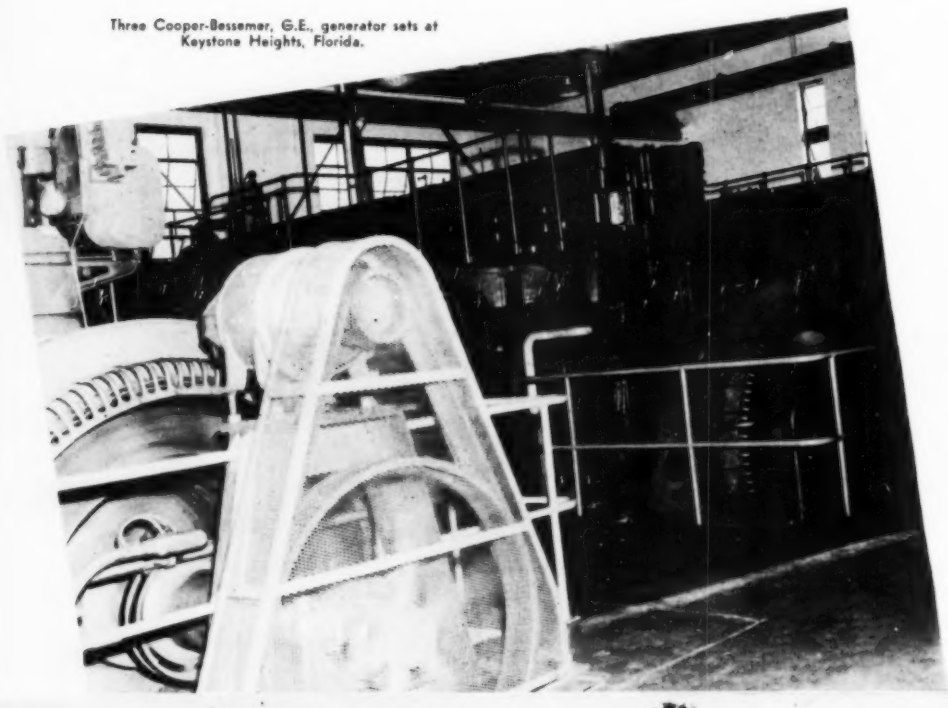
Before these engines had completed their test runs, two more Cooper-Bessemer, 1150 K.W., generator sets were ordered and are now being installed in a substation at Worthington Springs in the north-west of the Cooperative's territory. A second, unit type substation is projected as the consumers now number over 6,500.

There have been relatively few problems in the engine room, one being occasioned by the substitution of hard well water in the evaporative coolers for soft lake water. Scale formed and caused high water and lubricating oil temperatures. There were two broken exhaust valves, a damaged turbocharger and several flaked out bearings. The cooling is now done by radiators—Young radiators supplied by the Happy Manufacturing Co., Dallas.

No oil is added to any engine sump between changes, the practice being to run for two weeks and then reclaim the entire amount, fuel contamination thus being held extremely low. The use of turbo-supercharged engines permitted one to carry a 40% overload when a safety, cutout wire grounded and shut down the second engine on the same line. All five snubbers are Burgess.

Bob Dodd, plant superintendent, operated the original, two small sets and ran a filling station on the side, but with the formation of the Cooperative, he abandoned the latter activity and gave the power plant his full time. He has seen the capacity advance from its original 90 K.W. to the present 3940 K.W., with an additional 2250 K.W. to be added shortly when the Worthington Springs substation comes on the line.

Three Cooper-Bessemer, G.E., generator sets at Keystone Heights, Florida.



General view of Clay Electrical Cooperative, Keystone Heights, Florida.

RADIATOR REPAIRS

By DOUGLAS SHEARING

SERVICING radiators, after a fashion, can be done with little more than a bench, a testing tank and a soldering torch; and a great many so-called radiator repair shops do not have much more equipment than this. However, repairing radiators in any way other than a scientific, carefully checked routine, with certain definite tests, is to invite "come-backs" and dis-satisfaction. There are no short-cuts where guaranteed customer satifaction is the policy.

When the builder of diesel engine designs the cooling system, the radiator is so proportioned that it will provide sufficient cooling capacity to avoid over-heating of the engine under extreme conditions of engine operation. Atmospheric air temperatures may get up as high as 120 degrees, or even hotter, which cuts down the heat carrying ability of the cooling air, because of the decreased difference between air temperature and cooling water temperature. The engine may be working under heavy load, and consequent high rate of fuel input, with more heat to be dissipated by the radiator. If the heat that is generated by the engine is not dissipated as fast as it is generated by the power plant, the temperature will gradually increase, and overheating will result.

Therefore, the engine will be equipped with a radiator large enough to take care of engine cooling both under heavy loads and in hot weather. This cooling capacity will be much more than enough to keep the engine temperature down to normal under many conditions of operation, and this is the reason why much poor radiator work "gets by" until full radiator cooling capacity is required. Even with its tubes partially clogged up, the radiation may keep the engine temperature down for ordinary operation, because there still may be sufficient working surface exposed for moderate cooling and defective radiator work may not show until months after it is done.

There is nothing mysterious or particularly difficult about good radiator work, but certain fundamentals must be understood and observed. When these fundamentals are understood and observed and proper equipment provided, radiator work that is definitely satisfactory can be done profitably. High grade, fully tested work, can be performed in the well-equipped shop at as low a cost as mediocre, untested work in the one-man shop with inadequate equipment.

The first and most important operation on a radiator is to check its flow capacity. This test is passed up by most shops because they do not have equipment for it, though the necessary facilities can be built at a low cost. Every radiator is built to have a certain volume of cooling liquid pass through its tubes every minute, under certain pressure conditions. If the radiator does not have this rated flow capacity it will not perform as it should in dissipating heat from the engine coolant, and overheating will result, depending on the amount of variation from rated capacity.

Immersion in preliminary cleaning tank where outside of radiator is cleaned and, as far as possible, the inside. Radiators stay about one hour in this bath.

Every shop pretending to do quality radiator repair work should have flow-testing equipment, as there is no other way to determine the inside condition of a radiator, and the amount of clogging, if any, in the tubes. The flow-testing device need not be very complicated or expensive. An elevated vertical tank with a capacity of 60 to 70 gallons, provided with a gauge glass to show the water level in the tank, and a scale calibrated to indicate the number of gallons, is the principal item. A water outlet valve at the bottom and a water supply for filling the tank provide the liquid control means. A hose is attached to the water outlet valve, and connected to the top water hose connection on the radiator.

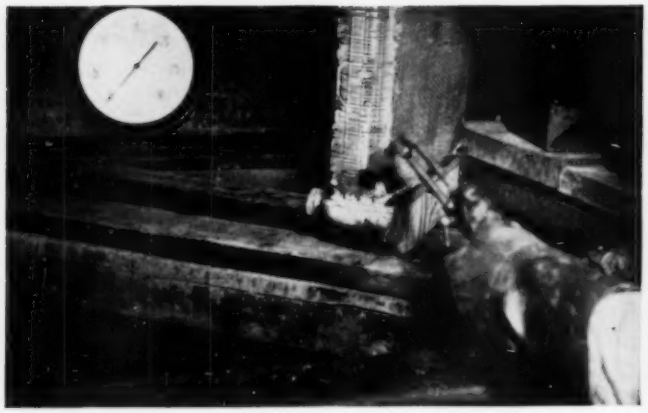
To make the flow-test, the tank valve is opened just enough to keep the upper radiator tank filled, and the water from the full test tank is allowed to flow for one minute—in at the top, down through the radiator tubes, and out the bottom. The number of gallons gone from the test tank is indicated on the scale behind the gauge glass is the flow per minute through the radiator. This figure, checked against the standard rated flow, will tell whether the tubes are open, as they should be, or are clogged up so that flow is restricted. This test will divide the radiators going through the shop into two groups—those which have normal flow, indicating open tubes, and those in which the tubes are clogged up more or less, and must be opened up to restore normal water flow capacity.

To hold the radiators in a vertical position while they are being flow-tested, a pipe frame is used, which is pivoted at one end so it can be swung up out of the way when not in use. The radiator is strapped to the members which are vertical when the frame is down, and this holds it firmly so the operator's hands are free to manipulate the water valve. The vertical tank is supported on legs about 5'6" long of 2-inch pipe, welded to a frame at the top made of 2" x 2" x ¼" steel angle. The swinging radiator frame is made of 1¼" pipe. A wire grating provides a platform on which to rest radiators so any size may be accommodated.

The next operation for all radiators is "boiling out" for an hour in a hot cleaning solution at a temperature of around 200 degrees Fahrenheit. This has a double purpose. The solution has a detergent action which will loosen up rust, scale, grease, mud, tar and paint externally, and to a certain extent internally, but will not affect the radiator metal. The two purposes are: (1) to get the outside in condition to be cleaned thoroughly, and (2) to loosen up caged material on the inside that may have temporarily closed up leaks, and also to loosen up the material that is clogging radiator tubes, as far as possible.

After a radiator has been in the cleaning tank for the required length of time, it is lifted out by means of a pulley suspended from an overhead track and removed to the drain board. The radiators as they come out of the tank are both heavy and hot. The hoist and trolley make it easy to handle them without danger or discomfort. The drain board is a wooden grating raised up about a foot off the floor by a concrete wall of that height to form a pocket for catching the liquid, so it can drain to the sewer. On the drain board, the radiator is stood in an upright position and cleaned, first on one side, and then on the other, with a heavy spray of hot water and compressed air. This knocks off all the external paint, dirt, grease or tar, so that the metal of the tanks and core is left bright and clean, which is a great aid in soldering later.

The same gun which is used to clean the exterior of the radiator is then inserted into the lower radiator hose connection and the compressed-air-hot-water mixture is forced through the radiator, up through the tubes. This has sufficient force to carry out any trapped cleaning solution material which may have closed temporary leaks, and a substantial part of the material that may have clogged up tubes. Many radiators are opened up nicely in this way, but some resist the treatment and require further steps. To protect the operator from the hot



Soldering up leaks.

Rodding out tubular type core. Water is forced through tubes at the same time to carry away clogging material.

water, etc., discharged from the top of the radiator, it is slipped behind a sheet metal shield or a heavy canvas apron while being blown out.

After being given the above treatment, those radiators which did not show full capacity in the original flow test, are sent back for another flow test to find out whether the boiling and blowing out removed the material that had clogged the tubes. There is no other way of determining this; so the flow test is really necessary. It removes any doubt about the ability of the radiator to pass the required amount of liquid for efficient cooling of the engine, or else indicates that the radiator must be worked on further.

The only remedy for tubes which cannot be cleaned out chemically is to remove one of the tanks, usually the upper one, and then rod out the tubes mechanically, one at a time, while clean water is forced through them to wash away the foreign matter loosened up by the rodding. This is absolutely the only way clogged tubes can be cleaned and the proper flow re-established if boiling out does not do the job. Not making the flow test is where a lot of shops fall down. Without the information given in the flow test, the operator cannot possibly know what condition the tubes are in unless the tank is removed from the radiator assembly, exposing the tubes for visual inspection.

An essential part of the equipment of the radiator department or radiator shop, is the testing tank, where the radiators are immersed in water, and checked for leaks, with about 10 pounds per square inch air pressure applied to the inside. The design and arrangement of this tank and its equipment are important factors affecting the efficiency with which the radiator mechanic can do his work. The tank must have a compressed air connection, with a regulator to hold the pressure down to ten pounds, and a pressure gauge with a dial large enough to be easily seen. It should also have a water connection to fill the tank with fresh water from time to time, and for flushing out the tubes while they are being rodded out.

The most important part of the tank equipment is a hoist to raise and lower the wooden platform on which the radiator rests while it is being worked on and tested. A very effective design utilizes an air cylinder attached to the bottom of the tank, in which is fitted a piston attached to the radiator platform. Two foot pedals, one for raising and the other lowering, control the level of the platform, by admitting compressed air to the cylinder or releasing it, respectively. Some radiators are very heavy, and the labor required to handle them should be kept to a minimum. When the unit being worked on is once on the platform it may be immersed in the water for locating the leaks, if any, and then raised for soldering. After soldering, it may again be immersed for testing and raised or lowered as many times as desired, with no effort on the operator's part except to work the foot pedals.

The platform provides a very convenient place to work on the radiator, for soldering leaks, for removing or replacing tanks, or other operations. Hydraulic, steam, or mechanical means can be used for raising and lowering the platform, but compressed air seems to be the preferred medium. It should be supported from underneath, so that there will be no cables, rods, or braces in the way.

After the second flow test has indicated the radiators which need rodding out, one of the tanks is removed on each and the rodding operation completed. After each individual tube is cleaned out, as indicated by a free flow of water out of each tube, the tank is reinstalled.

Each radiator is tested carefully under water, with air pressure on the inside, which will indicate definitely any leaks. Of the two, or four hose connections, one is used for connecting the air hose, and the others plugged with expandable rubber stoppers.

The soldering is done by a gas torch using compressed air to supply the oxygen. It gives an almost invisible flame, extremely hot, yet just right for the soldering operation. The metal surfaces on the radiator have been pretty well cleaned of paint, oil, grease and dirt, in the boiling out process, but to make the solder stick readily, a good soldering flux (liquid) is used. If the solder should not stick properly in some spots, hydrochloric acid is used to get a surface that will take the solder.

Getting just the right temperature is important in soldering, as the radiator metal must be hot enough to allow the solder to flow around the tubes or tank joint, yet not hot enough to burn or oxidize the solder. Wire solder is usually used, though where considerable solder is required, stick solder is more convenient.

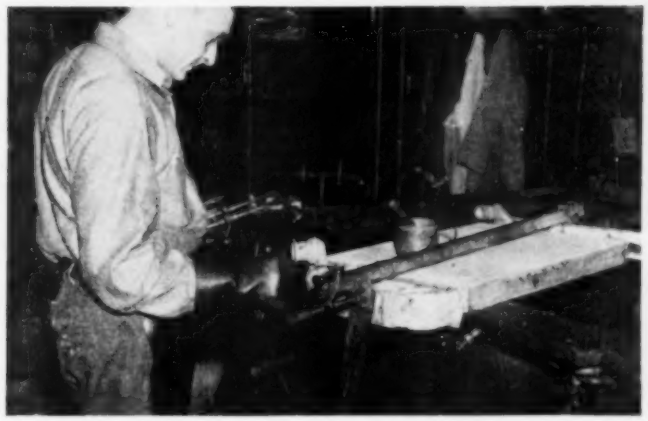
When the radiator is entirely free from leaks, it is taken to the drying oven to free it from all moisture. After it has been in the oven long enough to have all its external surfaces perfectly dry, it receives the final operation which is spraying with a coat of special dull black radiator paint, on both sides. This is done primarily for appearance, but it also has a very practical reason. It protects the solder with which the radiator is assembled from oxidation, so that if it ever has to be worked on again, the solder will be in such shape that it will flow freely under the torch, and a new solder will adhere to previously soldered surfaces.

When a radiator has passed the flow test and the under-water air test, there is no doubt whatever about its cooling ability and freedom from leaks. If there should be any cooling system troubles with the engine on which it is installed, the operator can rest assured that they are not due to the radiator, but to some other cause. It will be clear that any procedure short of that described cannot possibly be more than partially satisfactory. Some radiators will get by, but there will be plenty that will cause over-heating by poor heat dissipation, with consequent complaint and dissatisfaction.

A major item of equipment in the radiator shop is the boiling out tank, or hot chemical cleaning tank. The size of the tank will depend on the number of radiators it is designed to accommodate at one time. Allow about 40 to 50 gallons per radiator. A tank to hold ten to twelve radiators will have a capacity of around 450 gallons. Heating the tank adequately is one of the problems that must be solved by the shop operator, keeping in mind the cost of operation. Because of the wide variation in local conditions and different fuel costs, no general recommendations can be made.

Tank heating methods that are practical are: (1) steam, where a source of steam is available; (2) gas,

Radiator placed behind a shield and being blown out.



Soldering tank back in place after cleaning tubes.

either with an immersion burner for larger tanks, or open burners underneath, for smaller tanks; (3) electricity, where the rate is low enough to warrant its use; and (4) oil, using a pressure type oil burner, or other electrically driven type with ample capacity.

Where steam is used for heating the chemical solution, a coil is the heating element, mounted on the long side of the tank. It should never be placed on the bottom of the tank, because the sediment of mud, old paint, old grease and other foreign materials will collect on the tank bottom, and materially reduce the heating effect. Furthermore, it is very difficult to clean out the tank if the steam coil is located on the bottom. The coil should be held by means of brackets on the side of the tank, with easily accessible unions, so it can be conveniently removed. To avoid loss of steam, a trap should be installed to permit draining of the condensate. An agitation shield should be put in front of the steam coil to prevent violent surging of the liquid as it is being heated. A thermostatic valve can be used to maintain the desired temperature of 180 to 200 degrees (F).

If gas is the chosen fuel, one or two immersion burners, in which the gas is burned in combustion chambers surrounded by the liquid to be heated, will give efficient utilization of the fuel. If the cost of industrial gas is not too high, this makes a clean and satisfactory way of heating the tank. A thermostatic valve can be used to govern the amount of gas supplied to the burners so the desired temperature may be maintained.

Electric immersion heaters give practically 100% thermal efficiency, but the rate for electrical power may be high. This will have to be checked locally. For small tanks, the electrical heating method may be the most economical when the time taken to operate, clean and maintain the other types is taken into consideration. Temperature control by thermostat is easy with electric heaters.

Cleaning tanks are usually constructed of hot rolled steel sheets or plates, the thickness depending on the size of the tank. Usually the only reinforcement required is a heavy angle around the top. It is important that all seams be welded, preferably on both sides. Several features which will increase utility of the tank are: an over-flow dam which permits accumulated oil to drain off the surface, a nipple 2" to 3" long loosely screwed into the drain fitting in the bottom of the tank to prevent clogging of the drain, cross tees with plugs in place of ells, so the plug can be removed to rod out the pipe if necessary. Chemical cleaning companies around New York, will furnish blueprints of heated chemical cleaning tanks on request.

The concentration of the chemical cleaning solution in the tank must be watched to maintain it at the correct strength to do the required cleaning job, but it must not get too strong. Too strong a solution, increases unnecessarily, the cost of operating the tank, and may injure the metal of the radiators. This requires testing of the cleaning liquid every day or two, depending on how much the tank is used, and addition of fresh material to replace that lost through the chemical cleaning action and carried away from the tank in the radiators removed from it. For economical operation of the tank, it is advisable to have another tank of the same capacity, preferably vertical to save floor space, into which the liquid from the heated tank can be pumped periodically; say once a week, if the tank is used daily. At this time, the liquid is removed from the heated tank down to 2" or 3" from the bottom, which will be pretty thick with muck from the cleaning process. The solid part can be taken out with shovels, and the semi-liquid portion flushed out the drain pipe to the sewer. After tank is cleaned, the 85% approximately of the original solution that was pumped into the second tank is allowed to flow back into the heated tank. The part that was lost is made up by water and additional chemical. In this way by daily additions of water and cleaning material, and weekly or bi-weekly cleaning of the tank and replenishing the lost portion, the tank may be kept efficient at the lowest sost. The strength of the solution is tested by a hydrometer, much the same as radiation cooling solutions, or battery acids, are tested, with corrections for temperature in accordance with charts furnished by the supplier of the material. The supplier will furnish full instructions for making the tests and maintaining the solution that will give the user of this method the best results.

Summarize the important things to know about radiator service: (1) The flow test is absolutely necessary to tell what condition a radiator is in, where there has been overheating in the cooling system, or where the radiator has been damaged; (2) The only way radiator tubes can be cleaned out, where chemical cleaning will not do the job, is by rodding them out, with one of the tanks removed; (3) Testing under water with around ten pounds of air pressure in the radiator is the only sure way that leaks can be detected; (4) Proper cleaning of external surface is the only way the surfaces can be properly prepared so that solder can be applied quickly and cleanly; (5) Radiators should be painted after servicing them, both for appearance and to protect the solder and the radiator metal; (6) Damaged cores may be replaced and new cores assembled with the old tanks, but the assembly must be tested under water.

Types of Radiator Cores: There are three types of radiator cores: (1) Tubular type, made with flat tubes about 1/8" or less by 3/4" to 1", assembled in thin horizontal baffles spaced from an eighth of a quarter of an inch apart, with the tube ends soldered to header plates of copper or brass; (2) cellular, with straight passages, made from crimped and formed copper or brass strips, assembled by soldering, so a series of straighten water passages is left, with header plates attached at upper and lower ends of the core; (3) cellular with zig-zag passages, made up the same way as (2).

The tubular type of cores can be rodded out easily when the upper tank is removed. The straight-passage cellular type can also be rodded if this operation is conducted with extreme care in order not to damage the metal. The zig-zag cellular type is hopelss if the passages cannot be cleaned out chemically. In this case, either the core or the complete radiator must be replaced. Some large radiators have tanks which are bolted to brass or copper header plates.

Material and photographs: Courtesy of Northwest Ignition & Radiator Service, 3126 Clybourn Ave., Chicago 18.

Diesel trucks waiting at the loading point in California logging operation.

LOGGING AND SAWMILL OPERATIONS WITH DIESELS

By DOUGLAS SHEARING

THE accompanying illustrations show some of the logging and sawmill operations that are so easily accomplished nowadays with ever-ready diesels.

Compared to the complexity and difficulties inherent in this rugged industry even a decade ago, the facility with which ponderous logs are handled, trucked to the sawmill and rapidly converted into lumber of all kinds, is truly remarkable.

The big diesel trucks shown belong to the J. T. McDonald Logging Company of Anderson, California and work in a mountainous country on the edge of Lassen National Park, 10 miles west of Lassen Peak where they take on their huge loads of logs.

There are fifteen of these trucks and they carry the logs from the loading place to the storage pond of Shasta Plywood Inc., at Anderson, making the round trip of 102 miles three times daily, in 11 hours.

The lumber tract served is owned by the Bear Creek Logging Company and with over 750,000,000 feet of logs available, it is a good twenty-year operation. The McDonald trucks have been hauling out an average of 300,000 feet of logs a day, of which twenty to twenty-five per cent are high-paying peelers for plywood.

The trucks are very carefully serviced in a completely equipped shop 50 by 125 feet in size as great care is taken to keep them always on the job. The McDonald Company is very proud of these maroon and gold-lettered giants and even has them washed daily to keep up their fine appearance. It is planned to equip each with two-way radio as are the cars of the foremen and woods and trucks superintendents who are thus always in touch with the Anderson office.

On the other side of the United States in Virginia, many small operators find that diesels have not only made operations much easier but have made them pay.

Such concerns as the Lumber Distribution Company of Petersburg, Virginia, which purchases rough lumber for finishing at the planing mill shown in one of the illustrations, use diesels for all and every operation. This company not only uses a diesel as a source of power for the mill, but has diesel tractors for hauling lumber-carrying buggies in the yard and three diesel-engined trucks bringing in the rough lumber.

The Cox Lumber Company of Jewell Valley, Virginia, a 180-hp diesel to provide power for a 60-inch main saw, a 30-inch cut-off saw, a gang of edger saws and the slab and sawdust conveyor. Some 25,000 feet of miscellaneous lumber and main timber is the daily average of this mill, which greatly depends on its diesel equipment.

The small Virginia loggers also utilize winch and arch-equipped crawler diesel tractors for skidding logs to the mills deep in the woods.

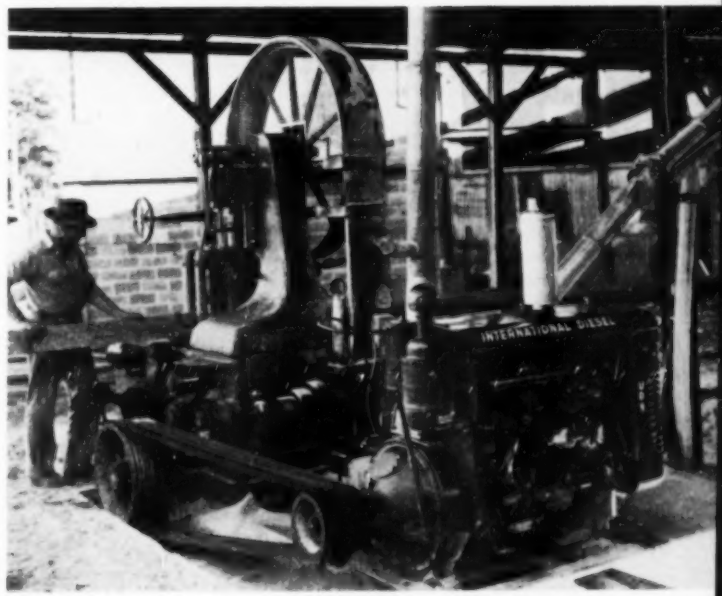
The diesel trucks mentioned in this article are International Harvester's "International Western Model." The diesel crawler and the engine supplying power to the sawmill are also products of International Harvester Company.

Rolling down the specially built highway through the woods to Anderson, California.

Piling on the heavy load.

Below: Rolling the logs into the storage pond at the Shasta Plywood Company, Anderson.

Right: Diesel-engined planing at Petersburg, Virginia.



Below: Diesel-crawler delivering logs to small sawmill deep in the southern Virginia woods.

INDICATOR DIAGRAM CONVERTER

By DOUGLAS SHEARING

THE device shown in the illustration mechanically converts pressure-time diagrams into pressure volume diagrams. Modern high-speed indicators usually give pressure-time diagrams, scribed, photographed, or spark recorded on a drum which rotates at a uniform velocity. Frequently the need arises to convert a pressure-time diagram into a conventional pressure-volume diagram. The determination of the horsepower and mean effective pressure is much easier from a pressure-volume diagram. The negative loops due to scavenging or too early ignition are visible on the pressure-volume, but not on the pressure-time diagram.

The graphical conversion of a p-t diagram into a p-v diagram is a tedious process, and there has been a long felt need in research and educational laboratories for a come simple and convenient means of making this diagram conversion. After an idea of K. Ostby of Norway, Dr. P. H. Schweitzer of the Pennsylvania State College has developed such an instrument. With it any pressure-time diagram can be converted into a pressure-volume diagram, by tracing the p-t diagram with a tracer stylus. The p-v scriber then draws automatically the pressure-volume diagram.

The principle of the instrument, is the reproduction of the crank motion by a mechanism. This mechanism, the two scribers, and three adjustments are combined in a simple compact and portable device, that can be operated on any desk or level drafting board. Instead of bringing the diagram to the converter, the converter is brought to the diagram.

The crank motion is performed by the rotating sheaves that, through the connecting rod, impart a reciprocating motion to the p-v scriber which is guided by four grooved wheels on a rail. The rotation of the sheaves is transposed into a translatory motion by the time rod which is held in frictional contact with the sheaves by a spring and two grooved wheels.

While the time rod moves out along the X-axis, the sheaves complete a 360 degrees rotation and the p-v scriber a complete reciprocation. At the same time the mechanism rolls along the Y-axis on a triangular rail by means of two grooved wheels, following the ordinates of the time diagram. The p-v ordinate is always equal to the p-t ordinate, as along the Y-axis the two scribers move together as one unit. In the time diagram, the combined motion imparted to the time rod produces the correct pressure volume diagram.

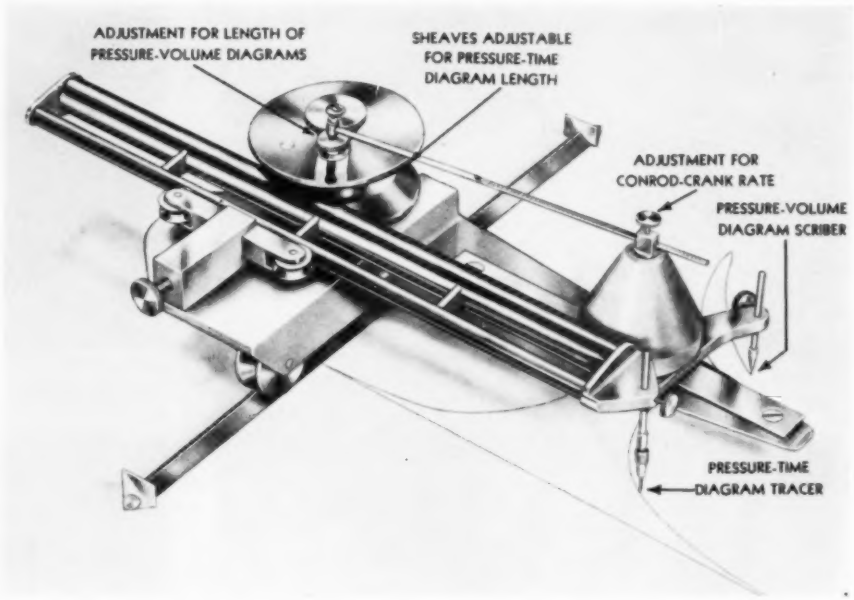
The contact radius of the sheaves must be such that while the p-t tracer covers the length of the time diagram the sheaves complete exactly one revolution. The sheaves are mounted on right-hand, left-hand screw bolts and in turning the knurled knob on top of the sheave the distance between them can be varied. Thereby the length of the complete p-t may vary from 8½ to 9½ inches. The length of the p-v diagram can be varied by changing the "crank" radius in pushing the conrod fulcrum in or out in its guide on top of the sheave. The conrod-crank ratio is adjusted by setting the rod length with a screw on top of the scriber cone. The length of the p-v diagram may be adjusted from 2 to 4½ inches, and the conrod to length ratio between 3.5 and 8. The crank radius and conrod length are provided with finely graduated scales for convenient adjustment.

The adjustment for a given time diagram length is effected by cut and try. When the time diagram tracer conincides with the inner end of the time diagram, the pressure-volume scriber must be at the extreme outer end. Pushing the time rod to the outer end of the time diagram, the pressure-volume scriber must again be at the extreme outer end. If the sheaves make less than one revolution while the time rod covers the length of the time diagram, the sheaves must be brought closer by turning the adjusting nut anti-clockwise. If the sheaves make more than one revolution while the time rod covers the diagram length, the sheaves must be opened more, by turning the knob clockwise. A couple of trials usually suffice to adjust the sheaves to the correct diagram length. The Aminco—M.I.T. and the Farnboro indicators produce time cards of 9 inches length. Pressure-time diagrams of less than 9 inches length as, for example, the p-v diagram of the Bacharach High Speed Indicator Type 4-HST, must be photographically enlarged to about 9 inches length to make them suitable for this conversion.

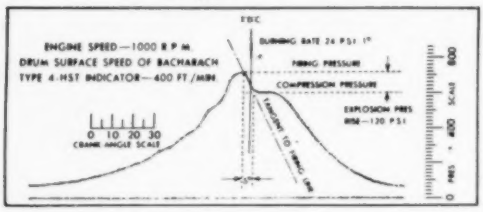
An attractive feature of the instrument is its small size and portability. The carrying case measures only 17 x 10 x 6 inches. From the case it is placed right over the diagram to be converted and once the adjustments are made the Converter is not more difficult to operate than a planimeter. In fact it is easier inasmuch as errors in tracing do not accumulate as in a planimeter but remain isolated.

The instrument is manufactured by Bacharach Industrial Instrument Company, Pittsburgh 8, Pennsylvania.

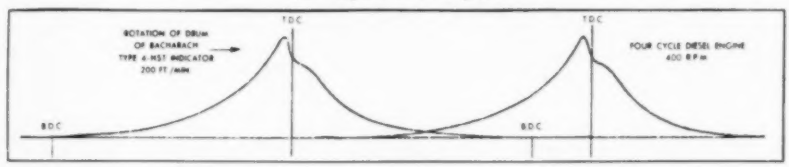
Indicator Diagram Converter.


ADJUSTMENT FOR LENGTH OF PRESSURE-VOLUME DIAGRAMS
SHEAVES ADJUSTABLE FOR PRESSURE-TIME DIAGRAM LENGTH
ADJUSTMENT FOR CONROD-CRANK RATE
PRESSURE-VOLUME DIAGRAM SCRIBER
PRESSURE-TIME DIAGRAM TRACER

Firing diagram at high drum speed to magnify combustion phase.



T.D.C. and B.D.C. points can be conveniently located by reference to compression diagram taken at same engine and drum speed.



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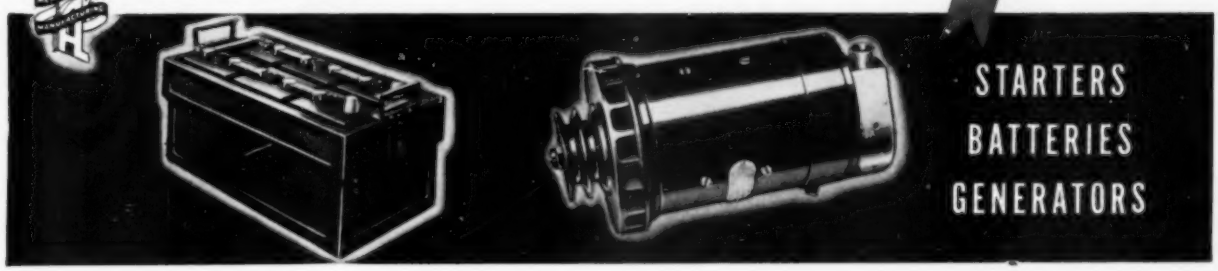
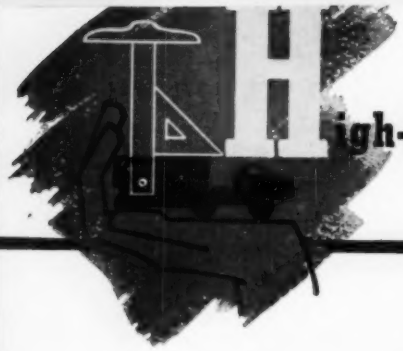


STARTERS
BATTERIES
GENERATORS



High-Speed Diesels . . . Design, Operation & Maintenance

CONDUCTED BY H. G. SMITH

Diesel Engine Exhaust Smoke

AS the number of diesel engines increase on the highways and in the cities, this subject becomes more important every day.

Just recently an article appeared in one of the most prominent newspapers of this country, which was an inditement of the diesel engine. It blamed the city's summer haze on diesel engines, at least, it stated that some authorities felt that an increasing share of summer time haze blanketing the city could be attributed to the great number of diesel equipped trucks operating with smoke pouring out of the exhaust and covering the streets.

It is so serious that the city's smoke inspector is instructing his staff of observers to halt and warn drivers of smoke creating trucks and to report the most flagrant violators to the police. This situation, of course, is not serious with the off-highway vehicles or industrial equipment so far as any one complaining about them, but since we all know that diesels don't have to smoke to deliver the power we should all do everything we can to prevent them from smoking. A diesel engine that is smoking is in poor mechanical condition, badly adjusted or else it is being run on improper fuel. The engine is not to blame but the owner or operator.

With the tremendous growth in popularity of the diesel engine for locomotives, trucks and buses it is mandatory that such engines be held to the smokelessness of which they are capable.

It is pretty well known throughout the diesel field that a diesel will not give off visible smoke or offensive invisible products providing the mechanical condition is good, the correct fuel is used and the operator handles the engine correctly.

The problem is different than in a gasoline engine where the air and fuel are mixed before they enter the cylinder. In a diesel engine a constant amount of air goes into the cylinder with each piston stroke and, the fuel injected at the top of the firing stroke varies according to the fuel throttle position.

The average diesel engine when operating at 25 per cent load will be getting about 40 pounds of air for every pound of fuel injected. This ratio changes as the per cent load increases. At 50 per cent load it is about 25 pounds of air to one of fuel and at full load the ratio drops to 14 to 1. If any greater amount of fuel is fed to the engine smoke will result because there is not enough oxygen present to burn this excess. All engines are set for what is generally known as the "Smoke Limit" at the factory and this maximum fuel is sealed so that it should not be tampered with.

H. G. Smith's background in diesel engineering renders his articles of great interest to those engaged in operation and maintenance of high-speed engines. From the Springfield, Ohio, Technical and Engineering school, he entered the Foos Gas Engine Company, Springfield and later, Springfield Motor Truck. With this experience behind him, he joined Hercules Motors Corporation where he was chief engineer for many years being with them when their diesel program was started. Executive engineer for Buda during the last ten years, he recently resigned to take up consulting work.

Operators find out that by breaking these seals and allowing more fuel to be injected they obtain more power but they fail to recognize that damage is being done and furthermore, causing the people on the highways and streets to complain to the city and state authorities.

Opening up the fuel stop is not the only cause of smoke. Engine temperature is also very important. Since it is definitely a heat engine and must fire by having high heat, it must be kept on the hot side. If the cylinders are too cool such as after a long idling period, the fuel being low in volatility, may not ignite properly.

Again, the choice of fuel is very important. Some engines require a higher volatility fuel than others and it is important that no lower grade of fuel is used than that recommended by the manufacturer. Most of the large operators recognize this fact, but, many times the smaller operater is faced with severe competition and attempts to lower his costs by buying the lower grade fuel.

Unfortunately there are not enough indicators of trouble to warn these people what is happening and too many times the damage is done before it is recognized. There have been many discussions about smoke and the diesel engine manufacturers as well as various societies have formed committees to discuss this subject but it is apparent that we are not making the headway we should. If in another five years the usage of diesel engines increases as fast as it has in the past five, it will probably reach the legislature stage and then the restrictions that they may impose will cause a lot of headaches.

It is the purpose of this article to appeal to the operators to be more careful. Don't let your equipment be operated in this smoke zone. Diesel engines are expensive in first cost and it is natural for all operators to work them to their maximum but let us not exceed this maximum set by the manufacturer. Buy the proper fuel, keep the engines hot and above all don't open up the fuel stop. The very fact that all high speed engine manufacturers continually stress these points should be sufficient warning to operators to follow these few simple rules.

All the reputable oil companies are doing their utmost to cooperate and help keep the fleet owner provided with the fuels and oils they need. It is somewhat obvious that some operators will continue violating the city and state smoke laws as long as they can get by.

It is safe to say that there is no high speed diesel in production today that can be called a smoker. It is true that some may require more frequent attention or demand a little more care in adjustment but most operators know after they have had their engines for awhile what the engine will or will not do.

There is one situation however that the fleet operator faces and which is something that is slightly difficult to overcome. It is the engine manufacturer's responsibility and cannot be avoided so long as each engine design has its own particular type of combustion chamber and injection system. It is the different grades of fuel required.

Some need a higher cetane fuel than others and the operator must provide two grades of fuel. In such cases there is only one answer and that is, buy the higher cetane fuel for all of his equipment. There is a slight increase in cost of the better fuel but the purchasing and storage problems are very much simplified by standardizing on the single fuel.

The engine manufacturer should not assume the attitude that this smoke complaint is entirely up to the operator. Sooner or later this smoke problem may develop into something that will prevent the broadening of his sales he so much desires.

Let us all take this matter very seriously. Keep the equipment in good working condition, use the correct grade of fuel and above all, don't open up the fuel stop, just because the engine "seems to be able to take it."

Most Popular Item...

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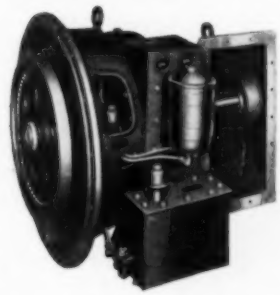
● Because Twin Disc Hydraulic Torque Converters permit exact "spotting" of heavy steel beams without jerkiness, contractors engaged in steel erection specify them as a "must" on their lift cranes.

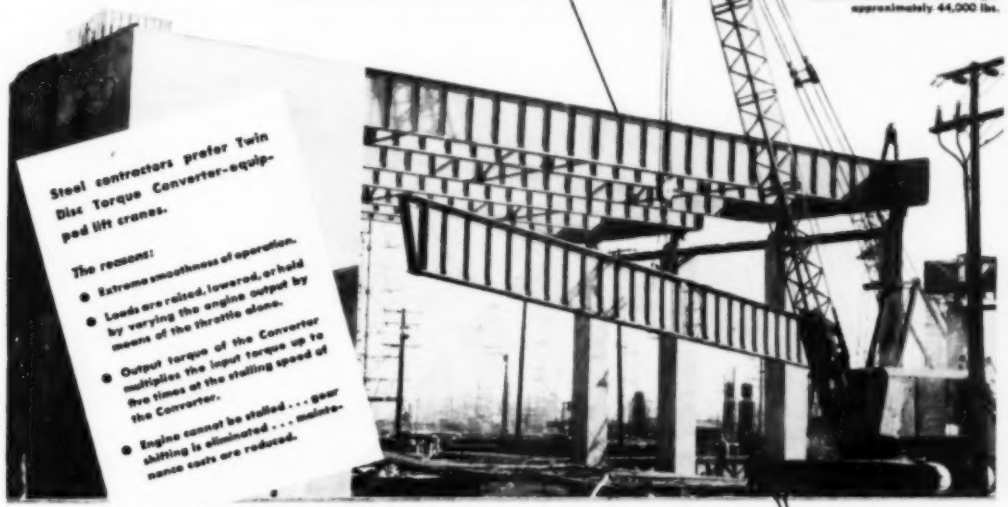
In this type of work, where both the travel and hoisting mechanisms are used more frequently than in other types of construction work, every load has to be started from a standstill and landed at a standstill. The Torque Converter allows such starts and stops to be made with great smoothness and easy exactitude—eliminating the need for friction control.

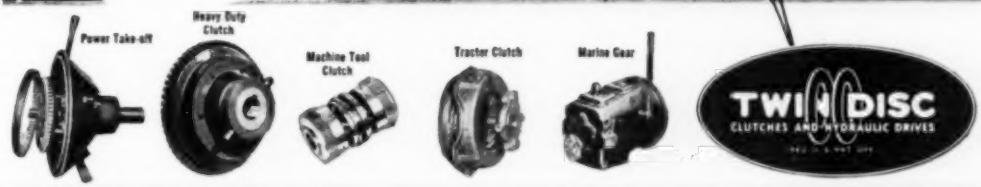
For complete information on these *smoother-than-steam* hydraulic power transmission units, write for Twin Disc Hydraulic Torque Converter Bulletin 135-C. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



Twin Disc Hydraulic Torque Converter (Lysholm-Smith type)

Model 3900 Manitowoc Speedcrane, powered with a Hercules HXB engine and equipped with a Twin Disc Torque Converter, erecting steel beams for the Terminal Island express highway bridge in southern California. Beam weighs approximately 44,000 lbs.


Steel contractors prefer Twin Disc Torque Converter-equipped lift cranes.
The reasons:
● Extreme smoothness of operation.
● Loads are raised, lowered, or held by varying the engine output by means of the throttle alone.
● Output torque of the Converter multiplies the input torque up to five times at the stalling speed of the Converter.
● Engine cannot be stalled . . . gear shifting is eliminated . . . maintenance costs are reduced.



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SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

E-M Reaches 6,000th Diesel Locomotive

The 6,000th General Motors diesel locomotive unit has left the production lines of Electro-Motive Division of General Motors, it was announced today by C. R. Osborn, Vice President of General Motors and General Manager of Electro-Motive. A 1,000 horsepower switcher for the Chesapeake and Ohio, the locomotive was built at Plant No. 3 in Cleveland, Ohio.

Today, an average of seven and a half locomotive units are completed each working day in the three Electro-Motive plants. Total horsepower of General Motors diesels in service on American railroads now is in excess of 8,000,000. Half this horsepower powers freight trains and the balance is in passenger, branch line and switching service. Electro-Motive's total diesel production to date also includes an additional 3,000,000 horsepower in diesel engines built for United States Navy LST landing ships and sub-chasers during the war.

Electro-Motive began operations 27 years ago with the construction of gas-electric motor cars. Late in 1930, it became part of General Motors and in 1935 construction of the main plant at La Grange was begun. The first diesel built at the new plant was a switcher for the Santa Fe, completed on May 20, 1936.

Electro-Motive employs 14,000 persons in three plants. Plant No. 1 at La Grange manufactures freight and passenger locomotives. Plant No. 2 in Chicago fabricates sub-assemblies and Plant No. 3 in Cleveland has an output of switching and branch line locomotives. In addition, General Motors recently announced plans for the establishment of a plant at London, Ontario, to manufacture diesel locomotives for Canadian railroads.

New Educational Director At D.E.M.A.

Robert S. Ogg

ROBERT S. OGG is now the educational director of the Diesel Engine Manufacturers Association. Ervin L. Dahlund resigned from this position on June first to become the chief engineer of the Diesel engine division of Fairbanks, Morse & Co. at Beloit, Wisconsin.

Mr. Ogg joins the DEMA staff from the Lima-Hamilton Corporation, Hamilton, Ohio, where he has been employed for a number of years in their engineering department.

A large part of Mr. Ogg's time will be spent with the accredited mechanical engineering schools of the country. The rest will be with the engineering departments of the Diesel engine builders and the forty-one manufacturers of parts, accessories and oils for Diesel engines that are assisting with this educational program.

Purolator Appoints New Advertising Manager

Karl H. Mayers

KARL H. MAYERS, formerly with United States Rubber Company in a promotional capacity, has been appointed advertising manager of Purolator Products, Inc., of Newark, New Jersey, Carlos D. Kelly, vice-president announced recently. Mr. Mayers, a graduate of Colgate University, class of 1941, served as an aerial gunnery officer in the Navy in the Pacific theater during the last war. The appointment, Mr. Kelly said, is another step in Purolator's intensified sales and promotional program on its fuel, lubricating oil and other types of filters for automobiles, aircraft, farm implements and industrial uses.

New Engineering Handbook

A NEW edition of the De Laval Steam Turbine Company's "De Laval Engineering Handbook" has just been published. A practical source of information on design, operation and installation of pumps, turbines, compressors and gears, it has been carefully revised and brought up-to-date. Engineers will find this a useful addition to their reference libraries.

Solid forged Marine Crankshaft restored to its original service QUICKLY AND ECONOMICALLY by having two new Crank Sections and one Main Journal assembled in place of the ones damaged in service.
Material used—Repair procedure—final inspection—All approved by AMERICAN BUREAU OF SHIPPING.
Don't permit damaged Crankshafts and other expensive critical parts to become a total loss. They can be economically restored to normal service by our time proven and guaranteed methods.
Many heavy and bulky parts can be repaired ON LOCATION by our especially developed machines, methods, and skilled personnel—thus effecting great savings in time, dismantling and transportation costs.
Call, Wire or Write.

"KEEPING PACE WITH DIESEL PROGRESS"

WASHINGTON IRON WORKS, INC.

Established 1876

SHERMAN, TEXAS

WHAT...LOWER YOUR B.T.U. COSTS IN THE FACE OF HIGH FUEL PRICES?

You Can!

With fuel costs sky high...with competition becoming keener daily...something *has* to be done to get more out of every available B. T. U....*and something can be done!*

Perhaps you *did* carefully survey your fuel economy a few years ago to determine whether an investment in heat exchanger equipment would be profitable.

Perhaps yours was a marginal case and you *did* find that the investment at that time was not warranted. Like others who have *recently* recalculated, however, today you may find that heat exchangers *can* lower your B. T. U. costs substantially...especially because of two noteworthy developments.

1. A vast research program at Ross has boosted the heat conserving performance of traditionally efficient Ross Exchangers.
2. Wide spread Ross standardization has brought about low unit cost.

In combination, these industry-leading feats have, for comparatively nominal investments, pulled down B. T. U. costs for many a plant by eliminating needless and costly waste. This applies not only to first-time users of exchangers, but long-time users as well who are now finding that adding Ross equipment pays off...*quickly!*

Ross Heater & Mfg. Co., Inc., Div. of American Radiator & Standard Sanitary Corp., 1425 West Ave., Buffalo 13, N. Y. In Canada, Horton Steel Works, Ltd., Fort Erie, Ont.

★ Whether or not you have made a recent heat consumption survey, why not consult a Ross heat exchanger engineer now? No obligation in finding out from him how to increase the B. T. U. return from every fuel dollar you spend.

ROSS

EXCHANGERS...*MAKE OTHER PRODUCTS BETTER*

Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON

White Announces Complete Series of Diesel Units

View of one of White Motors long-haul diesel trucks.

WITH the increasing costs of gasoline, particularly in those states where it is heavily taxed, a definite place has been found for diesel equipment on long sustained runs. To meet this need, The White Motor Company has developed its diesel offerings and is toady announcing an entire line of trucks, tractors, and six-wheel units in this field. A complete selection to fill the demands of heavy duty operators who prefer diesel power, plus the regular White WC series of conventional trucks and tractors and the revolutionary new White 3000 series, puts White in a position to satisfy all requirements with the most efficient type of equipment.

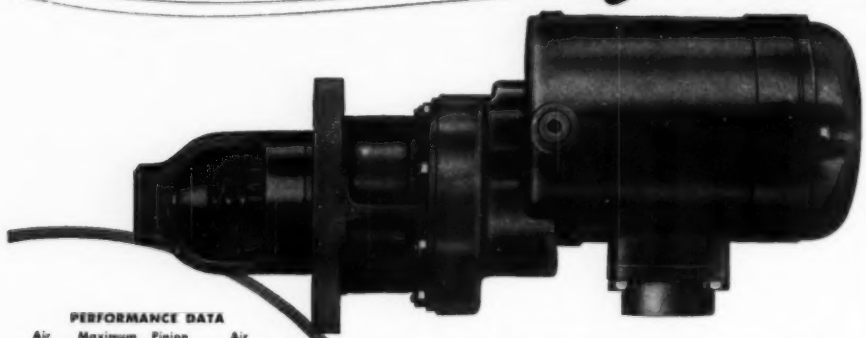
The White-Diesel line is designed and built in close conformity with the needs of the user, and presents many advantages. Vehicle weights are lighter than those of most diesels, and the distribution of weight is such that greater payloads can be carried in states with restrictive axle loadings. Excellent balance and unusually good roadability are inherent in the new line. In addition, the vehicles present a most favorable appearance. Powerful engines and gear ratios to meet all conditions assure top efficiency in operation.

The White-Diesel models are powered by a Cummins diesel engine of 743 cu. in. displacement, developing 200 horsepower at 2100 RPM and a torque of 535 lbs. ft. at 1200 RPM. Fuel system includes tractor oil bath type air cleaner and fuel tank of 44-gallon capacity. The muffler and stack of the exhaust system are mounted at the right rear corner of the cab. The cooling system makes use of a centrifugal design water pump with full by-pass thermostat and total radiator and engine capacity of 38 quarts. Starting motor is of the 24-volt, straight drive type, and the generator is the 12-volt, 50 ampere type with current and voltage regulation.

In addition to its regular diesel line, The White Motor Company also puts out a line of "Western Diesel" models, similar to the standard truck and tractor models but having special transmission and auxiliary transmission to provide additional gear reduction. These are designed to meet the special requirements of the eleven western states.

The White-Diesel series, under test for some time, has demonstrated its advantages from an operation standpoint. For heavy-duty highway hauling, there is a model to suit every load and operating condition.

Air is safe! Air is free!



PERFORMANCE DATA

Air Pressure p. s. i.	Maximum Dev. H.P.	Pinion R.P.M. (Approx.)	Air Consumption c.f.m.
100	10	3000	250
150	15	3000	400
200	20	3000	550

Variable factors control motor application. Under normal cranking conditions one motor may crank engines up to 1000 or more cu. in. displacement. Two motors may be used for larger engines.

AIR CAPACITY REQUIREMENTS

A 20 cu. ft. storage tank at not less than 150 p.s.i. should give about 30 seconds cranking. This varies with engine size and temperature. Maximum permissible pressure 250 p.s.i. When temperatures drop to freezing or lower it is desirable to have pressure of 100 p.s.i. or more and an ample supply of air.

APPLICATIONS

Typical applications include: mobile road and construction equipment, stationary engines used in hazardous atmospheres (milling, mining, oil refining and related industries), small generating plants and numerous marine applications where compressed air is available at suitable pressure.

Harness It For Quick, Dependable Low-Cost Starting With The LEECE-NEVILLE

Air Cranking Motor

● Here is an air-operated motor which guarantees absolutely safe starting of Diesel and gasoline engines in the presence of flammable matter or in combustible atmospheres and at the same time offers economy, dependability and long-term satisfaction in any application. Wherever compressed air (or natural gas under suitable pressure) is available . . . the Leece-Neville Air Cranking Motor may often be the most practical method of engine cranking because it eliminates electrical upkeep and requires a minimum of maintenance itself. See your nearest Leece-Neville Service Station for an analysis of your starting problems or write us direct.

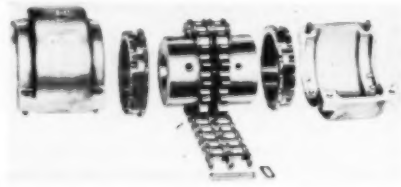
The Leece-Neville Company, Cleveland 14, Ohio.

LEECE-NEVILLE

Pioneer and STILL Quality Leader

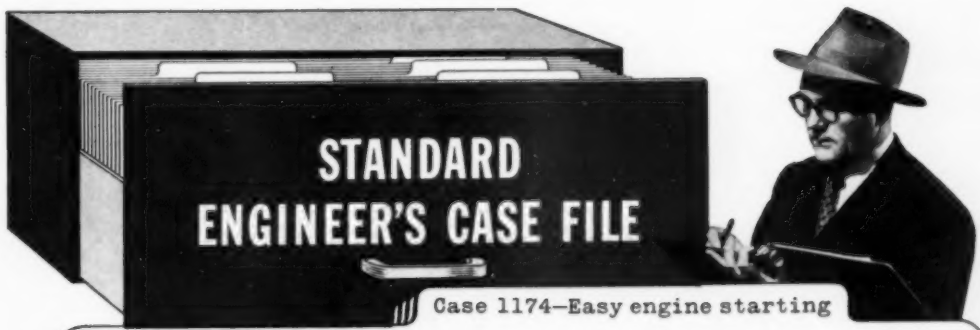
New Casings for Diamond Flexible Couplings

IN extending its line of flexible shaft couplings, Diamond Chain Company, Inc. of Indianapolis announces also the development of new lightweight revolving casings. Made of aluminum alloy, they are split axially to permit installation or removal in a space no longer than the coupling itself. Two types are made, one of which, the type A, is shown in the accompanying exploded illustration. This shows the pliable seals which fit over the sprocket hubs at either end to enclose the lubrication. They are made to engage with the 2-strand Diamond Roller Chain and are locked in place by the casing.



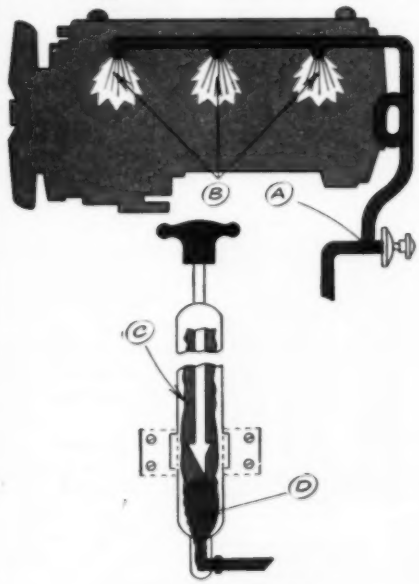
Exploded view shows Type A Diamond Chain Flexible Shaft Coupling with seal rings that fit on hubs to confine lubrication.

Besides insuring continuous lubrication, longer life and safety, casings protect against abrasive and corrosive atmospheres, and improve coupling performance generally.



Case 1174—Easy engine starting

Engines start in 10 seconds at 50° below zero!



PRIMER EQUIPMENT

When Chevron Starting Fluid was sprayed into intake manifolds of engines that had been standing idle all night in 50° below zero weather, they started in less than 10 seconds of cranking. Valuable for starting at low temperatures in either gasoline or Diesel engines. Comes in convenient, easily handled capsules of two sizes -- 7CC's and 17CC's, packed 12 and 24 in metal containers. Also available for bulk use in 3-pint cans.

Chevron Starting Fluid is atomized and injected into intake manifolds as engine is cranked ... process is continued until engine warms enough to run on regular fuel ... primer equipment may be purchased from fluid supplier.

A. Pump of primer system mounted on dash convenient to engine operator ... forces fluid to manifold.

B. Nozzles adapted to manifold atomize fluid.

C. Special tool for puncturing capsules containing fluid supply ... installed near pump convenient to operator.

D. Capsule in puncturing tool ... one or more at a time may be used.

FREE BOOKLET that tells how to start engines quicker and easier and is yours for the asking. Just send requests by letter or postcard to one of the companies listed below.

Chevron Starting Fluid contains a lubricant that helps prevent starting wear on upper cylinder walls and promotes easier starting. An oxidation inhibitor and other special additives prevent formation of deposits in engines and ice crystals in primer equipment.

Trademark Reg. U. S. Pat. Office

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, N. J., Chicago, New Orleans

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

CHEVRON STARTING FLUID

Free Test Cleaning Service Offered

THE Magnus Chemical Co., Inc., Garwood, N. J., manufacturers of automotive and industrial cleaning chemicals and equipment, announces the inauguration of a free production test cleaning service.

Companies wishing to test a new cleaning method or material can eliminate the time, expense and bother of conducting cleaning tests on their own premises by taking advantage of this new service. At Magnus, where a wide variety of cleaning equipment and chemicals are available in a special building provided for the purpose, full scale production cleaning tests can be conducted under actual working conditions.

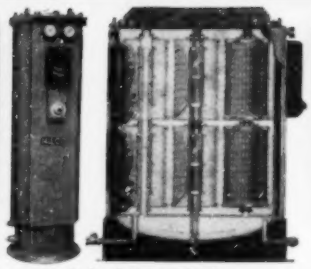
The building is equipped with four mechanically agitated cleaning machines featuring three different types of agitation. These are in addition to a turntable type spraying and rinsing machine. Two different types of cleaning tanks have also been installed, along with a drying oven, deburring and burnishing barrels, a steam gun and solvent cleaner sprayer. Both heated and unheated machines and tanks are available.

With the above equipment it is now possible to determine not only the best chemicals, equipment and method for achieving a desired cleaning result, but actual cleaning times and costs can be accurately recorded as well. Thus the best and most economical cleaning procedure can be determined in any particular case.

Those interested in improving their cleaning set ups are invited to turn their problems over to Magnus Chemical Company.

There's a HILCO that will best fit into your Lubricating and Fuel Oil Filtering Plans · · ·

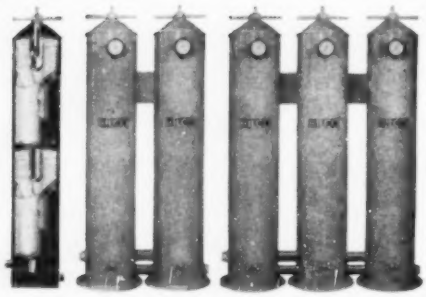
HILCO HYFLOW OIL FILTERS "S" SERIES



HILCO HYFLOW OIL FILTERS "R" SERIES SPACE SAVERS

For lubricating oil or storage to engine fuel oil filtering using 5" x 11" and 7¼" x 18" Filter elements. Easy and quick to service.

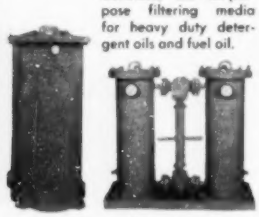
For lube oil using one or a multiple of 11" x 18" Filter cartridges easily handled by the operator, offering large filter area and proper depth to assure complete saturation of filter material. Available with and without heaters.



*Both are interchangeable at any time.

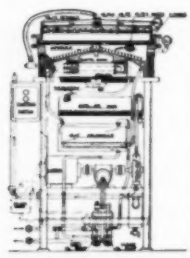
Hilco Hyflow Oil Filters use Hilite-Fuller's Earth for filtering straight mineral and fuel oil or Hiltex-Cellulose, the all purpose filtering media for heavy duty detergent oils and fuel oil.

HILCO HYFLOW OIL FILTERS "C" SERIES



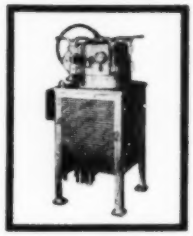
For Lube and Bulk Fuel using one or a multiple of 7¼" x 18" Filter cartridges offering the maximum in filter area and correct depth for high flow rates and efficient filtration. Available in simplex type with or without heaters, duplex without heaters.

HILCO OIL RECLAIMERS



For direct connecting to one or more engines for perfect and complete lube oil purification—removing carbon, sludge, abrasives, tarry matter, and acids, water and fuel dilution — and color restoration.

Hilite-Fuller's Earth for filtering straight mineral oils—ADSTAY DISCS for heavy duty detergent oils.



CLEAN OIL MEANS CLEAN ENGINES LOWER MAINTENANCE COSTS . . . .

WRITE TO-DAY! FREE LITERATURE

LET US RECOMMEND THE CORRECT OIL PURIFICATION EQUIPMENT

THE HILLIARD CORPORATION 122 W. Fourth St., Elmira, N. Y.

OFFICES IN PRINCIPAL CITIES

Diesel Symposium at Madison, Wisconsin

Shown viewing diesel engine parts at the American Bosch corporation exhibit are, left to right, W. J. Bailey, Illinois Testing Laboratories, Chicago; Harold Wright, U.S. Naval Postgraduate School, Annapolis, Md.; Harvey T. Hill, of the Diesel Engine Manufacturers' Association, Chicago; Dean Morton O. Withey, of the University of Wisconsin College of Engineering; and Realf Ottesen, of the Norwegian Motor Engine Manufacturers' Institute, Trondheim, Norway.

UNDER the sponsorship of the University of Wisconsin in cooperation with the Diesel Engine Manufacturers' Association, a very successful symposium was held at the university in Madison from August 29 to September 3, inclusive.

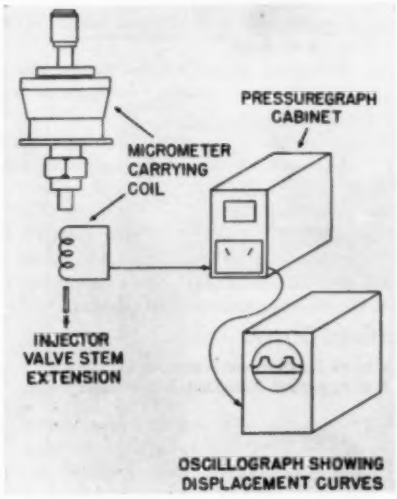
Attended by some 175 diesel experts from across the country, the leading colleges, universities and diesel industries were all represented.

Panel discussions and papers on some thirteen major subjects ranging from undergraduate technical instruction to highly technical problems were given. The University of Wisconsin engineering laboratories were also visited by the symposium delegates and interesting and instructional talks were given there by members of the university faculty.

Visits were also paid to the Fairbanks-Morse plant at Beloit and the Nordberg plant at Milwaukee where the visitors were not only given comprehensive plant tours but were very hospitably entertained by their hosts.

Among the exhibiting firms at the Memorial Union Building where the symposium was held were the following concerns: William W. Nugent & Co., Houdaille-Hershey Corporation, Young Radiator Company, Illinois Testing Laboratories Inc., American Air Filter Company, Fram Corporation, American Bosch Corporation, Commercial Filters Corporation, Manzel Inc., Scintilla Magneto, Sealed Power Corporation, Air Maze Corporation, Woodward Governor Co., Aluminum Company of America, and Nordberg Manufacturing Company. Competently manned, full explanations of the numerous and interesting exhibits were given all visitors, to the booths.

Displacement Measuring Device



A DISPLACEMENT measuring attachment has been developed for use with the Electro Pressuregraph equipment, for making accurate micrometer measurements of reciprocating motion, valve opening, valve bounce, or any motion including vibration. It will also show a displacement versus time curve on the screen of a cathode ray oscillograph which is of importance when measuring acceleration of other phenomena.

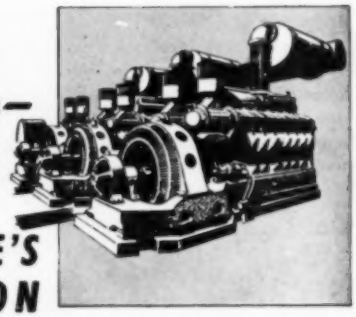
As shown in the sketch, a coil energized with a high frequency voltage source is mounted in a conventional micrometer head. The voltage drop across this coil is made to vary by the movement of the valve stem in the coil field. This movement changes the inductance and therefore, the reactance of the coil which produces a voltage variation across this coil.

In use, the displacement curve is viewed on an oscillograph screen as a modulated high frequency envelope. The minimum height of courve (valley) is observed. This corresponds to zero displacement or movement. Next, the micrometer sleeve carrying the coil is backed off or away from the moving body, until the maximum envelope height is reduced to the previously noted minimum. The total displacement is then read directly on the Micrometer as the difference between the two settings. The large 2" Micrometer sleeve on this attachment is calibrated in tenths of thousandths of an inch. The large diameter of the Micrometer sleeve permits easy reading down to a ten thousandth of an inch. This device enables the Pressuregraph to perform some of the functions of the Electro Dynamic Micrometer announced in previous news releases. The new Micrometer Adapter, Model 3610 was designed for use with the Model 3700A Pressuregraph which has been on the market for the last two years. Electro Products Laboratories, Inc., of 549 West Randolph Street, Chicago 6, Illinois, developed the above described attachment.

Get your 1949, Fourteenth Edition of Diesel Engine Catalog now. Just off the press and entirely re-written as well as brought up-to-the-minute, it is a MUST for all connected with the diesel industry. ORDER TODAY.

Throughout the Power Industry—

Aerofin units do the job Better, Faster, Cheaper



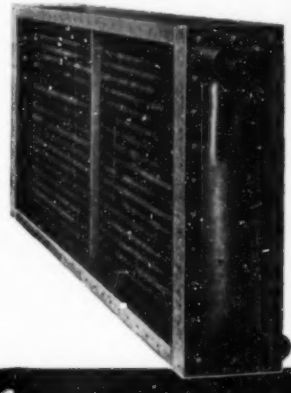
...AND HERE'S THE STORY ON

AEROFIN

This air-pressure test is one of many tests used to control the quality of Aerofin finned heat-transfer surface. If no bubbles appear in the specially illuminated tank, it means the immersed Aerofin unit has withstood the terrific strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.

Rigid specifications and inspection, backed by more than 25 years of experience in manufacturing finned heat-transfer surface, assure you of Aerofin dependability, durability and maximum efficiency.

Aerofin is devoted exclusively to the production of finned heat-transfer surface. This specialization enables Aerofin to select just the right surface and materials for the job, and to assemble these materials into a highly efficient unit.



Day after day, thousands of Aerofin Finned Heat-Transfer Units demonstrate their superiority under the most severe conditions. Complete research has developed accurate ratings which allow you to install Aerofin at full rated capacity with confidence.

AEROFIN CORPORATION
410 South Geddes St
Syracuse 4, N. Y.
NEW YORK • CHICAGO • CLEVELAND • DETROIT • PHILADELPHIA • DALLAS • MONTREAL

New, Revised an Re-written Diesel Engine Catalog Has Added Features

THE FOURTEENTH EDITION of DIESEL ENGINE CATALOG just off the press contains some now features of great utility and interest to all connected with the diesel industry.

Not only has the entire book been re-written to make it even more easy-to-read and individual items even easier-to-find than heretofore, but, in addition to the up-to-the-minue information on all model changes and new engines, two new and valuable "extras" have been included. These are, (1) An entirely new section on transmission, and (2) A unique diesel horsepower range chart showing each manufacturers' horsepower coverage at a glance.

No other book gives such complete and detailed information on diesels and accessories, completely up-to-date and checked by the manufacturers themselves.

The five sections of this comprehensive book are as follows:

(a) An engine section fully illustrated with complete descriptions and specifications.

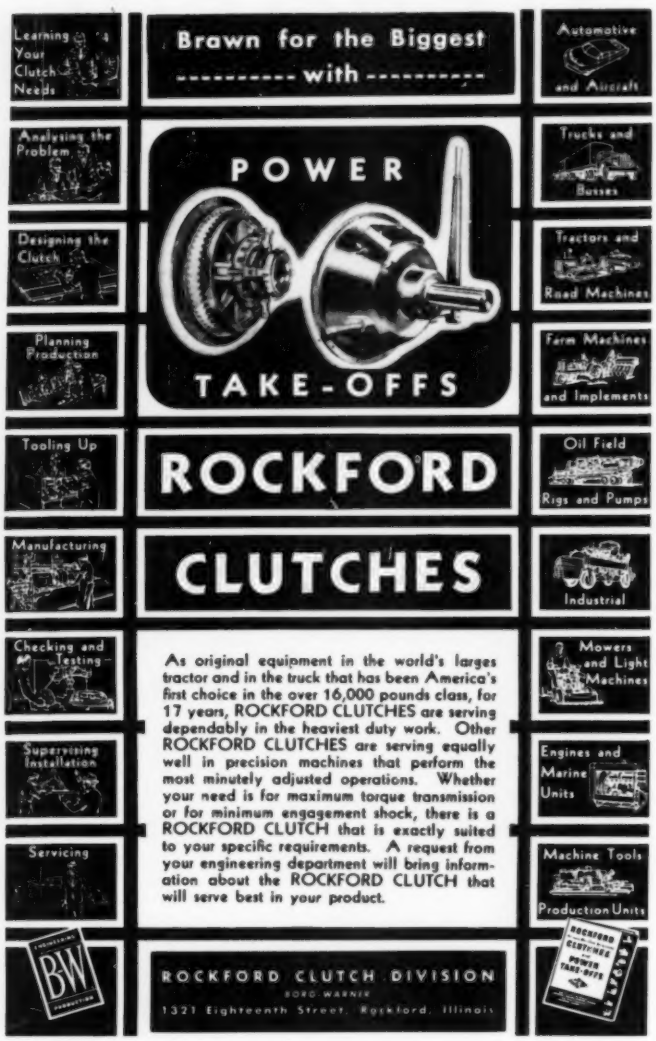
(b) An accessory section describing engine and plant accessories.

(c) A transmission section—a new feature in this edition of the book.

(d) A classified Buyers' Guide—"Market Place," covering diesels, accessories, transmissions and other allied products.

(e) A large advertising section carrying a wealth of information for design and purchasing engineers.

The new Diesel Engine Catalog is a MUST for design, operating and maintenance engineers; is indispensable for buyers and an invaluable aid to engineering instructors and students.


Brawn for the Biggest
with
POWER
TAKE-OFFS
ROCKFORD
CLUTCHES
Learning Your Clutch Needs
Analysing the Problem
Designing the Clutch
Planning Production
Tooling Up
Manufacturing
Checking and Testing
Supervising Installation
Servicing
Automotive and Aircraft
Trucks and Busses
Tractors and Road Machines
Farm Machines and Implements
Oil Field Rigs and Pumps
Industrial
Mowers and Light Machines
Engines and Marine Units
Machine Tools Production Units
As original equipment in the world's larges tractor and in the truck that has been America's first choice in the over 16,000 pounds class, for 17 years, ROCKFORD CLUTCHES are serving dependably in the heaviest duty work. Other ROCKFORD CLUTCHES are serving equally well in precision machines that perform the most minutely adjusted operations. Whether your need is for maximum torque transmission or for minimum engagement shock, there is a ROCKFORD CLUTCH that is exactly suited to your specific requirements. A request from your engineering department will bring information about the ROCKFORD CLUTCH that will serve best in your product.
BW
ROCKFORD CLUTCH DIVISION
BORG-WARNER
1321 Eighteenth Street, Rockford, Illinois

Chief Engineer Named at Enterprise Engine & Foundry Co.

John H. Sheusner

THE appointment of John H. Sheusner as Chief Engineer was recently announced by Paul I. Birchard,, vice-president of Enterprise Engine & Foundry Co. in San Francisco. During his five years with the company as Chief Design Engineer, Mr. Sheusner has been in charge of all new design developments incorporated in the complete line of Enterprise Diesel Engines. His new post encompasses the engineering activities of the Oil Burner Division and the Food Process Machinery Division, as well as marine and stationery diesel engine operations.

Top Changes in Lima Hamilton

Daniel S. Ellis

SAMUEL G. ALLEN has resigned as chairman of the board of directors of Lima-Hamilton Corporation, and has been succeeded by John E. Dixon, formerly president of the company. George A. Rentschler will continue as chairman of the executie committee and chief executive officer, while Daniel S. Ellis has been named president succeeding Mr. Dixon. W. A. Rentscheler is now executive vice president, and Henry F. Barnhart, of Lima, Ohio, vice president in charge of shovel and crane sales, was made a director of the firm.

New Penflex Vice President

WILLIAM TOWNSEND, long associated with the Pennsylvania Flexible Metallic Tubing Company as Sales Manager, has just been named Vice President in Charge of Sales by the Board of Directors of the company. Mr. Townsend started with the company more than fifteen years ago as a sales correspondent. Previously Mr. Townsend has been a consulting engineer for many years.

Announcing a New Piston Ring Material
"CYCLAN"
Especially developed for severe service in high duty diesel and gas engines. This superior material has the following necessary qualifications of a good piston ring alloy!
✓En Value higher than 20,000,000.
✓*Tensile Strength* in excess of 60,000 P. S. I.
✓*Extreme Resistance* to Property Changes under operating conditions.
✓*High Impact Value* for shock resistance.
✓*High Resistance to Breakage* and the ability to undergo considerable distortion prior to fracture without sacrificing resilience.
✓A Structure that assures excellent wear qualities.
Write for additional information.
Sealed Power
PISTON RINGS · PISTONS
CYLINDER SLEEVES

Engineering Changes at International Harvester

H. T. REISHUS, general manager, International Harvester industrial power division, has announced a change in structure in the engineering department and the following appointments: W. O. Bechman, chief engineer, advanced engineering group; M. R. Bennett, chief engineer, product engineering group; H. V. Parsley, chief engineer, government engineering group; and J. W. Curley, chief engineer, experimental and test group.

The reorganized functions of industrial power engineering will be under the direction of D. B. Baker, manager of engineering.

Schoonmaker Announces Opening Of New West Coast Plant

MR. A. G. SCHOONMAKER, President of A. G. Schoonmaker Company, Inc., of New York City, who has been in the power machinery field for over 50 years, recently announced the opening of their new Diesel Plant at Sausalito (San Francisco) California.

This plant is situated in Marin County, which is just north of the Golden Gate Bridge, fifteen minutes from the heart of San Francisco. Located at this advantageous site, the plant comprises an area of over nine and one-half acres and has in addition to building facilities for the remanufacturing of their Diesel equipment, excellent indoor storage accommodations for the engines, generators and auxiliary equipment. The area also has several railroad sidings with one spur running completely through the main shop building. This gives great flexibility in expediting the handling of incoming and outgoing freight shipments.

The remanufacturing shops are staffed with both skilled diesel and electrical personnel. All facilities are under the direction of Halsey H. Lyon, Plant Manager.

With the addition of these new facilities together with their present shops located at Jersey City, New Jersey, the Schoonmaker Company is in a position to ship diesel equipment promptly from either Coast for both domestic and foreign use.

WORLD'S WIDEST RANGE of SMALL DIESELS!

3 h.p. at 600 R.P.M.

10 h.p. at 600 R.P.M.

8 h.p. at 1200 R.P.M.

16 h.p. at 1200 R.P.M.

9 h.p. at 1000 R.P.M.

18 h.p. at 1000 R.P.M.

30 h.p. at 1200 R.P.M.

40 h.p. at 1200 R.P.M.

Count them! EIGHT different models all under 40 H. P. Larger sizes also, up to 300 H. P. There is a Lister-Blackstone for every use and application.

MORE DIESEL FOR YOUR DOLLAR!

Write us your requirements

"The Diesels That ENDURE"

Lister-Blackstone

Factory, Sales and Service Headquarters:

420 Lexington Avenue, New York 17, N. Y.

Parts Warehouses: MILWAUKEE, Wis., 3073 S. Chase Street

BOSTON, Mass., Whesco Building, Fish Pier

Agents: BOSTON, Diesel Engine Sales & Engineering Corp.; NEW YORK, Griffin Equipment Corp.; NORFOLK, Va., Curtis Marine Co.; NEW ORLEANS, La., (Branches at MOBILE, Ala. and TAMPA, Fla.), Calmes Engineering Co.; MIAMI, Florida, Auto-Marine Engineers; HOUSTON, Texas, Southern Engine & Pump Co.; NEWTON, Iowa, Winpower Manufacturing Co.; MONTREAL and TORONTO, Consolidated Engines & Machinery Co., Ltd.; WINNIPEG, Mumford, Medland, Ltd.; VANCOUVER, B. C., Hoffars, Ltd.; ST. JOHNS, Newfoundland, Clayton Construction Co.

Helical Planetary Reduction Gear Installed on "Mary Petrich"

Reduction gear on "Mary Petrich."

THE main reduction gear of the *Mary Petrich* is a Pacific-Western Type HP Helical Planetary unit especially designed for use with modern high speed diesel engines of high horsepower output. It is built on the planetary principle, having a high speed sun pinion, stationary ring gear and six planetary pinions on a rotating spider. The small size and light weight of this helical planetary reduction gear is gained without sacrifice of reliability and without carrying any greater loads on gears and bearings than in conventional reduction gears by utilization of the planetary principle and distributing the imposed load over multiple tooth contacts instead of only one contact as in ordinary parallel shaft gearing.

This type of gear is ideally suited to this application because it is relatively small and compact and light in weight in comparison to conventional parallel shaft type of reduction gears. Its compactness allows it to be installed in the aft end of the shaft alley in space otherwise unusable. Beside the weight saved from the lighter weight unit, considerable weight is also saved by being able to place the gear further aft of the engine, thereby using a greater proportion of small diameter shafting.

The gear unit itself weighs 3495 pounds, but the saving effected by being able to place it far aft of the engine makes for a weight saving in shafting several times the total weight of the gear. This saving in shaft weight is made possible be-

cause the input shaft from the engine of the gear unit is of smaller diameter than the output shaft from the unit to the propeller.

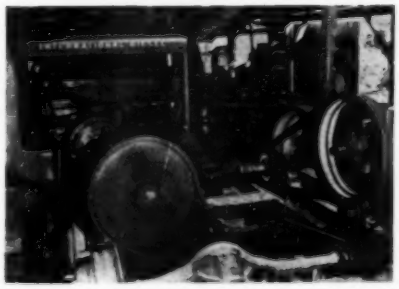
The reduction gear is manufactured by Western Gear Works of Seattle, San Francisco, and Lynwood at the Lynwood, California Plant. The Helical Planetary unit is a partner to the Bevel Planetary gear also manufactured by this company. Between the two styles of planetary reduction gears, a wide range of engine speeds can be accommodated. The bevel type unit was used in the *Sherry Ann*, tuna clipper also built by Western Boatbuilding of Tacoma.

New Director of Engineering for Fairbanks, Morse & Co.

Frank M. Mason, Jr.

FAIRBANKS, MORSE & CO., announce the appointment of Frank M. Mason, Jr., as Director of Engineering. He will continue to be located at the firm's headquarters office, Chicago, Illinois. Mr. Mason, who has for several years been Manager of the Research Division in Charge of all research, developments and patents, joined the Company in 1922 following his graduation from Northwestern University, the Massachusetts Institute of Technology and Washington University. He was first employed in the engineering department of the Company's Indianapolis plant. In 1923 he was transferred to St. Louis to organize a patent department for the firm. In 1925 he entered the Research Division in Chicago and became successively assistant manager in 1940 and manager in 1946. He is well known in navy circles and is a member of the American Society of Naval Engineers.

Novel Drive in Southern Sawmill



Diesel horsepower is harnessed for hourly production of 2000 board feet of Southern hardwoods by this novel truck-axle drive arrangement in the S.O.S. Lumber Company's Corinth sawmill at Memphis, Tenn. Owner Wayne B. Smith designed the rig, which controls every operation except turning the log on the carriage. Through it, the International diesel drives the 60-inch, 80-tooth main saw; two 16-inch edgers; a swing cut-off saw; double-end trimmer; the feed works; carriage; two sawdust conveyors; a winch, and a green lumber chain. Mill capacity is 20,000 board feet in a 10-hour day.

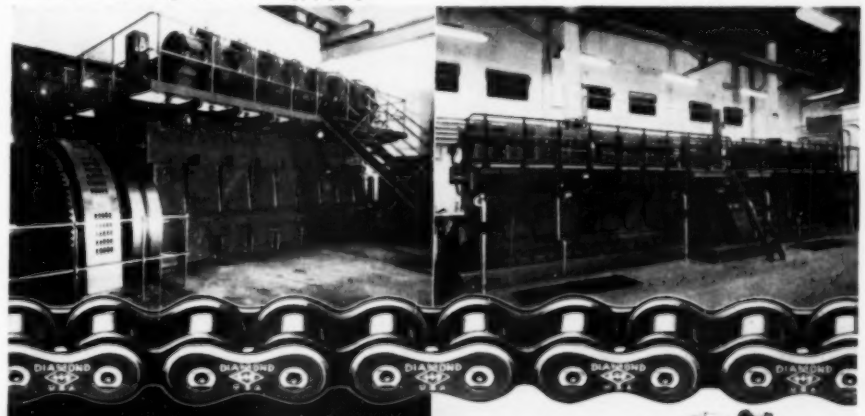
DUAL FUEL ENGINES

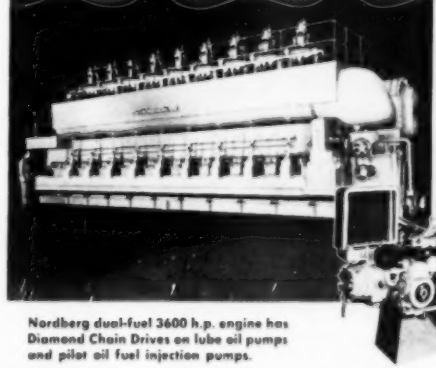
Equipped With

DIAMOND ROLLER CHAINS

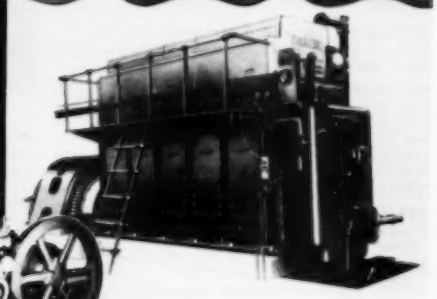
Fulton dual-fuel engine with Diamond #472 triple Chain on both primary and secondary timing drives, #148 triple for the water pump, #148 double on the lube oil pump drive, and #148 single on the fuel supply pump.

Two Cooper-Bessemer 2-cycle 1000 h.p. engines driving 1500 KW generator. Diamond Chain camshaft and fuel pump drives.





Nordberg dual-fuel 3600 h.p. engine has Diamond Chain Drives on lube oil pumps and pilot oil fuel injection pumps.



Buckeye 4-cycle dual-fuel engine with Diamond triple #470 timing drive and #148 quad for lube and water pumps.

Lorain dual-fuel engine,— White-Roth Machine Corp.

● Due to the greatly reduced operating costs, Dual-Fuel engines have been installed in greatly increased numbers during the past few years.

On many well-known 4-cycle dual-fuel engines, Diamond Roller Chains are used for such drives as camshaft primary and secondary timing, fuel oil pumps, lube and water pumps.

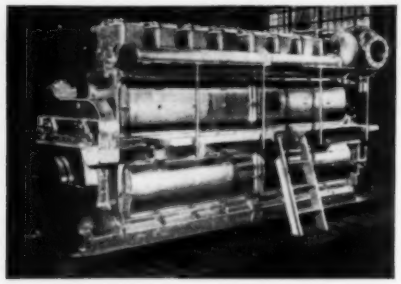
On 2-cycle engines as regular and replacement applications, they provide ideal long center drives for the positive operation of the valves needed to take care of gas intake without waste exhausting with the scavenging air.

A quarter century of service on engines has given ample proof of the long-life efficiency, uniform quality and dependability of Diamond Roller Chains. Discriminating engineers invariably make them first choice.

DIAMOND CHAIN COMPANY, Inc., Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana. *Offices & Distributors in All Principal Cities.*

DIAMOND ROLLER CHAINS

The ALCO PLAN for DIESEL ECONOMY



FLEXIBILITY AND LOW COST OFFERED BY ALCO STANDARDIZED ENGINE

THE ALCO plan helps Diesel plants where flexibility, economy, dependability, and provision for future growth are important. In one size of stationary Diesel engine, ALCO offers unusual advantages where multiples of 540 to 1,300 horsepower can be used.

LOW COST...This basic design, also used in ALCO switch engines, is quantity-produced to make both first cost and the cost of replacement parts unusually low.

FLEXIBILITY...You can fit fluctuating load curves more closely than with fewer engines of larger size, or of varied capacity.

LESS WEAR...This more efficient use of engines means less wear per installed horsepower. The unused capacity of operating engines at any time need not exceed the capacity of one engine. There is no wear on the idle engines. Larger engines would necessitate greater wear per installed horsepower, with resulting higher costs.

GREATER EFFICIENCY...With engines operating near rated load, fuel consumption is less and operating conditions are better.

UNIFORM ENGINE WEAR...With several units of the same size, engines can be operated in rotation, allowing planned inspection and maintenance with minimum "down time."

STAND-BY ECONOMY...When all units are the same size, stand-by capacity can be limited to one size of engine the same as all others. With a variety of engine sizes, stand-by capacity might easily have to equal the largest single unit.

SIMPLIFIED MAINTENANCE...Uniform engine size means uniformity of replacement parts and of maintenance procedures; smaller stocks of parts; minimum of special tools; shorter "down time."

EASY GROWTH...As demand increases, gradual growth can take place by adding extra units of the same size.

• • •

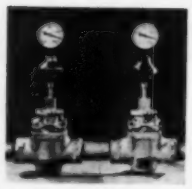
What your actual savings can be with this compact, efficient engine should be computed carefully. Call in an ALCO engineer to discuss the ALCO plan in relation to your needs.

AMERICAN LOCOMOTIVE COMPANY

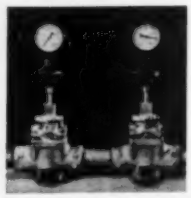
Department D6, 30 Church Street, New York 7, N. Y.

ALCO
STANDARDIZED
DIESEL ENGINES

Automatic Lubrication Arrives For Pressurized Plug Valves



Comparative tests showing pressure retention: The valve on the left is pressurized at 350 psi with non-energized lubricant on a test line. The valve on the right of identical type is pressurized to 350 psi with automatic energized lubricant.



Same valves six months later: In the valve on the left pressure of non-energized lubricant has dropped to 0 psi. In the valve on the right pressure of energized lubricant shows negligible decline.

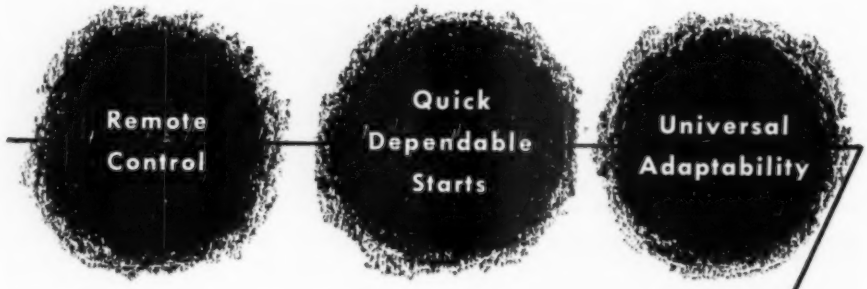
IN the use of pressurized plug valves on lines carrying oil, water, gas, chemicals, slurries, etc., the one objection voiced by engineers is the necessity of frequent re-lubrication. Now it is claimed, this obstacle is eliminated. A new system of lubrication has been born which does not require the investment of one cent in mechanical force-feed devices and is applicable to the more than 5,000,000 valves of the Nordstrom type now in service.

Christened *Hypermatic*, this lubricant seemingly establishes a new principle in fluid dynamics. For the first time in the history of lubricant development, a compound has been created which is both compressible and expansible and embodies dynamic properties wherein energy may be stored for prolonged periods to give automaticity to its feeding action. Therefore, if a lubricated plug valve of the Nordstrom type should ever "spring" a leak, the automatic force-feed action of Hypermatic instantly seals the void. If the valve has been neglected, it keeps itself in a state of 100 per cent lubricated condition and remains energized. Pressure does not quickly decline but may remain for months.

In a lubricated plug valve lubricant is used for three purposes: (1) To maintain a film on the unexposed seat to permit easy turning of the plug; (2) To form a pressurized seal around each port by the use of connected grooves on the plug and within the body; (3) To act as a hydraulic jack to raise the plug slightly off its seat if the plug ever becomes hard to turn. Lubricant is introduced into the valve through a hole in the shank of the plug. Sticks of lubricant are dropped into the hole and a lubricant screw is inserted, which when turned, exerts powerful hydraulic force to transmit the lubricant through the channels. But this force deteriorates in case of leakage. Hence, constant pressure is desirable so that pressure at any level will effectively push the necessary amount of lubricant into the void.

Hypermatic is the "missing link" to effect automatic action. Being compressible, from 50 to 100 per cent more can be inserted and stored for future use. Turning of the lubricant screw builds up the energy similar to the action of a door check which stores energy to automatically close

Whatever Your Diesel Starting Problem



Bendix Drive can solve it Economically!

Every type of Diesel equipment has its own particular starting problems, and that's why the Bendix* Drive can save you money. Built with fewer parts, the Bendix Drive has a simplified design that results in low-cost operation and maximum adaptability. Here's real starting economy—as proven on over 70 million Bendix Drive installations!

*REG. U. S. PAT. OFF.

ECLIPSE MACHINE DIVISION of ELMIRA, NEW YORK

Bendix AVIATION CORPORATION

the door. Any amount of pressure can be built up within the valve but the lubricant will actuate with a pressure of as low as 50 lb. In very high pressure service the energy is built up to 1000 lb and higher. It is self-feeding even though the line pressure is greatly in excess of the valve's internal lubricant pressure.

Hypermatic is volumetrically flexible; it is self-sealing; self-acting; less lubricant is used because the operator neither over-lubricates nor under-lubricates the valve. When pressure is finally exhausted Hypermatic functions the same as a non-energizable valve lubricant, but by again turning the lubricant screw a few revolutions or by replenishing the supply of sticks (or use of pressure gun), re-energization takes place.

Of the more than 5,000,000 plug valves of the Nordstrom type, more than 75 per cent are immediately receptive to this lubricant on temperature lines from sub-zero to at least 250 F. Tests are now being conducted to increase the temperature range. The manufacturers of Nordstrom valves claim that savings of many million man-hours per year will be made by its use, without present users investing a cent in equipment because re-lubrications will only take a fraction of time previously consumed by maintenance men.

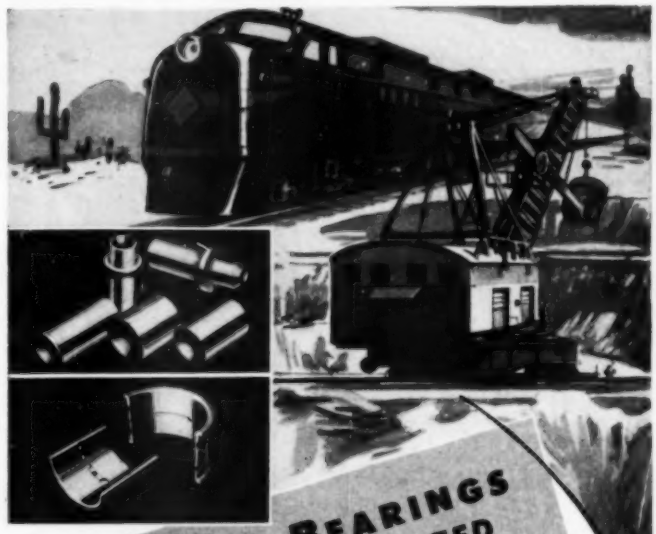
Hypermatic is the most revolutionary development since the introduction of Nordstrom valves 30 years ago, according to W. F. Rockwell, Jr., President of Rockwell Manufacturing Company. The man who conceived and created Hypermatic is George F. Scherer, since 1927 Director of Research for Rockwell's Nordstrom Valve Division. The research laboratories are in Oakland, California, where the lubricant has been in process of development for years. During the past year exhaustive tests in laboratory, shop and field have been conducted to authenticate every claim before placement of the product on the market for Nordstrom valves.

An interesting bulletin giving very detailed information and answering every conceivable question regarding Hypermatic has been prepared and may be obtained by writing to Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 8, Pa.

Assistant to President of Purolator

JAMES D. Abeles, formerly equipment sales manager of Purolator Products, Inc., has been elected assistant to the president, Ralph R. Layte, president of the company, announced. Before becoming equipment sales manager, Mr. Abeles had served sucessively as cost reduction engineer, quality manager, assistant plant superintendent and assistant works manager. He joined the company in 1940.

James D. Abeles



JOHNSON BEARINGS have DEMONSTRATED their efficiency in Diesels

THE unfailing performance of Johnson Bearings has been convincingly proved in the diesel field. They are engineered for each application with the requirements thoroughly understood . . . operating speed, load, shock, temperature, corrosive conditions, etc. Then, Johnson Bearings are carefully and accurately produced by highly trained and skillful workmen . . . from high quality materials. Performance records prove that the leading manufacturers of diesel engines choose wisely when they select Johnson Bronze to furnish their bearings.

***JOHNSON ENGINEERS** will gladly study diesel builders' requirements and make recommendations on the type and design of bearings needed. Write, wire or call for an appointment today!*

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1 plan helps prevent all 3

When you show the people in your company that you're interested in their welfare, they naturally rea t favorably. That's why *production goes up* when you boost your employee-participation in the Payroll Savings Plan. Here's how it happens:

The more U. S. Savings Bonds an employee holds, the more secure he feels. The more secure he feels, the greater his peace of mind—the more contented, careful, and productive he is on the job.

Those facts aren't just something we dreamed up. They're borne out in the experience of more than 20,000 companies promoting the Plan.

Everybody Benefits!

Bond sales spread the national debt, thus increasing our national economic security. And, of course, what's good for the nation is good for you and your business!

The individual Bond buyer gets back $4, when his Bonds mature, for every $3 he invested. That's a boon for him, and—multiplied by millions of Bond holders—represents a huge backlog of purchasing power that will help assure national prosperity through the years ahead.

Five Steps Boost Participation

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Payroll Savings Plan's benefits to them.

4. Make a person-to person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

5. Urge each new employee, at the time he is hired, to sign up.

Nation-wide experience indicates that 50% of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bonds Division. He is listed in your telephone directory. Wouldn't it be a good idea to call him right now, while it's on your mind?

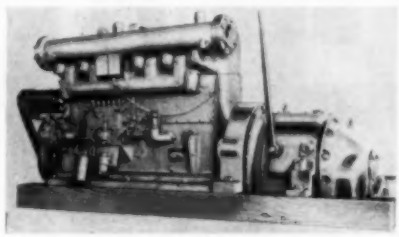
The Treasury Department acknowledges with appreciation the publication of this message by

Editor—DIESEL PROGRESS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.

New Red Wing Marine Diesel

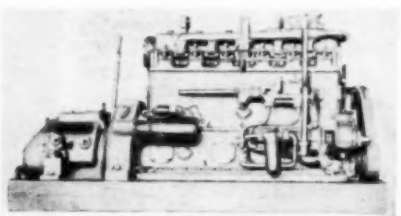
THE Red Wing Motor Company of Red Wing, Minnesota, has announced a new marine diesel now ready for delivery.



Port side view of new Red Wing marine diesel.

Rated at 200-hp at 1300 rpm, the new engine is one of several sizes now being developed which will enable the company to offer a full line of marine diesels ranging from a 4 cylinder 30-hp unit up to the 200-hp engine just announced.

Named the "Super-Duty" marine diesel, it is a 6 cylinder, 4 cycle, overhead valve type with a bore of 6¼ inches and a stroke of 6½ inches. The piston displacement is 1197 cubic inches. The 1300 rpm at which the engine is rated is designed for continuous service. It is of



Starboard side of same engine.

rugged and durable design with a crankshaft of 4¾ inches diameter with seven extra large main bearings. It is available as a direct drive unit or with 2:1 or 3:1 reduction gears. The lubrication system includes oil-cooled pistons. It also has wet type cylinder sleeves and is designed for economy of maintenance and service and to be able to burn a wide selection of easy-to-find diesel fuels.

Standard equipment on this diesel includes a complete fresh water cooling system with heat exchanger, expansion tank and extra raw water pump built-in. It can also be adapted for keel type cooling if desired.

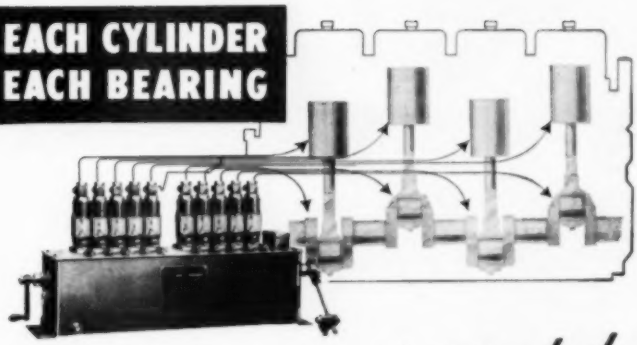
Electric starting or starting by means of a 4 cylinder Red Wing gasoline engine are optional.

The approximate weight which varies slightly according to the equipment ordered, is 5200 pounds.

G-E Unit Promotes King

MARTIN R. KING has been promoted from assistant manager, apparatus department news bureau, General Electric Co., Schenectady, N. Y., to manager of the bureau. He succeeds C. P. Fischer, Jr., named manager of a new promotional division, activities of which will be announced later.

EACH CYLINDER
EACH BEARING



Individually Lubricated

BY faithfully delivering precise amounts of oil to cylinders, bearings, and other points of friction, Manzel Lubricators save engine owners up to 60% in reduced oil consumption and lowered maintenance costs. Write for further information

Manzel Brothers Co. now supplies repair parts for all models of Bowser and Torrington Lubricators.

Builders of HIGH PRESSURE METERING PUMPS Since 1898

Manzel BROTHERS CO.

A Subsidiary of Frontier Industries, Inc.

275 Babcock Street Buffalo 10, N. Y.

THE BIG NEW
Quincy COMPRESSOR
model D-390

FOR RUGGED DIESEL STARTING JOBS

Model D-390 is a Diesel starting unit composed of a 390 Quincy Compressor and electric motor mounted on a structural steel base. Compressor is two-stage air-cooled with piston displacement of 90 c.f.m. for discharge pressures up to 250 p.s.i. Design features include—aluminum cylinders and head — Lynite rods — copper-finned intercooler — perfectly balanced crankshaft — Timken bearings — positive pressure lubrication. Also available with gas engine drive. For rugged Diesel starting jobs select Quincy Model D-390. For any starting job, select from the complete line of Quincy Compressors ranging in size from 1 to 90 c.f.m.

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DIESEL ENG

VOLUME 14
1949 EDITION
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This comprehensive book is brought up-to-date every year. Carefully revised and checked by the manufacturers themselves, its complete and profusely illustrated data include numerous changes, new types and models and re-designs with up-to-the-minute information on diesel and dual-fuel engines manufactured in this country.

Design and Consulting Engineers keep Diesel Engine Catalog at hand for easy reference throughout the year.

Product Engineers find its accurate, easy-to-find data of great value.

Engine operators use its wealth of factual information as an invaluable aid to good maintenance and service.

Technical Instructors and Students consult it as an unsurpassed reference book.

NGINE CATALOG

The following are manufacturers whose engines are fully described with tabulated specifications:

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Baldwin Locomotive Works
Buckeye Machine Co.
The Buda Engine Co.
Burmeister & Wain
Caterpillar Tractor Co.
Chicago Pneumatic Tool Co.
Clark Brothers Co., Inc.
Consolidated Diesel-Electric Corp.
Continental Motors Corp.
Cooper Bessemer Corp.
Crofton Diesel Engine Co., Inc.
Cummins Engine Co., Inc.
Enterprise Engine & Foundry Co.
Fairbanks, Morse & Co.
Flagship Engine Co.
Fulton Iron Works Co., Inc.
General Motors Corp.
Cleveland Diesel Eng Div.
Detroit Diesel Engine Div.
Electro-Motive Div.
Gray Marine Motor Co.
Hallett Manufacturing Co.
Harnischfeger Corp.,
P & H Diesel
Hercules Motors Corp.
Hill Diesel Engine Co.,
Div. of Drake America Corp.
Ingersoll-Rand Co.
International Harvester Co.
Kermath Manufacturing Co.
The Lathrop Engine Co.
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ENTIRELY REVISED AND REWRITTEN!

A MUST for design and operating ENGINEERS!

INDISPENSABLE for BUYERS!

INVALUABLE to INSTRUCTORS & STUDENTS!

IN NO OTHER BOOK can be found such complete and detailed information on diesel engines and accessories. Rewritten in its entirety while being brought up-to-date, great attention has been given to make Diesel Engine Catalog an easy-to-read book. Its unique chart showing Diesel Horsepower Ranges by manufacturer and its comprehensive classification and indexing, all contribute to making any item easy-to-find.

FIVE BOOKS IN ONE HAVING FIVE INTEGRAL SECTIONS, this catalog is indispensable whether for technical reference or selective buying:

(a) An engine section fully illustrated with complete descriptions and specifications.

(b) An accessory section describing engine and plant accessories.

(c) A transmission section—a new feature in this volume.

(d) A classified buyers' guide—"Market Place", covering Diesels, accessories, transmissions and other allied products.

(e) A large advertising section. Manufacturers' advertisements carry a wealth of information for design and purchasing engineers.

DIESEL HORSEPOWER RANGE CHART: This catalog includes a new and startling chart showing horsepower ranges of diesel engines classified by manufacturer. By giving at a glance the range of horsepower ratings of the engines offered by each firm, it is a new and valuable aid to all connected with the Diesel Industry.

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Enter my order today for a copy of the 1949 Diesel Engine Catalog, Volume Fourteen. Edited by Rex W. Wadman, for which I enclose $10.00, also payable at £3 5s. 0d. to E. H. Doddrell, 342 St. Paul's Corner, Ludgate Hill, London E.C.4.

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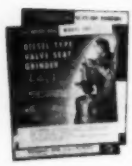
(Please Print)

CAN YOU SERVICE THIS DIESEL VALVE SEAT ?

For grinding large diameter diesel valve seats, no grinder matches the EDP, in speed, precision, or finish. And it is more economical, to own and to operate. The eccentric grinder revolution makes for longer wheel and pilot wear, longer life for the seat. Grinds any metal. Arrange to investigate it.

WATERBURY-HALL
DIESEL TYPE
MODEL E D P
VALVE SEAT
GRINDER



For further information on Waterbury-HALL eccentric grinders and accessories, Form 3F-793 and 3F-854. Write direct to factory.

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WATERBURY-HALL

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WATERBURY TOOL
DIVISION OF VICKERS INC.
WATERBURY 91,
CONNECTICUT, U.S.A.

Innovation in Docking of Transatlantic Liners

AN innovation in the docking of huge trans-Atlantic liners was inaugurated in New York harbor Thursday morning (August 25) when the Cunard White Star liner *Queen Mary* was berthed by five diesel-electric tugs instead of the customary ten steam tugs heretofore required.

Docking operations were handled by the Moran Towing & Transportation Company which recently took delivery of the *Moira Moran*, the last of five new 105 ft., 1,750 hp. tugs especially designed for this New York docking service, and built at Orange, Texas, and powered with Diesel-electric drive furnished by the Cleveland Diesel Engine Division of General Motors.

Moran officials stated that the greater horsepower and maneuverability of their five new tugs would enable them to dock the *Queen Mary* and other big ships quicker and more efficiently with only one-half the number of tugs previously needed. Marine experts also predicted that such dockings hereafter could be made at considerable savings in cost.

George W. Codrington, vice president of General Motors and general manager of Cleveland Diesel Engine Division of that company, returning on the *Queen Mary* from a business trip to Norway, was an interested spectator of the new docking operations.

Young Radiator Announces New Cooler Catalog

YOUNG Radiator Company, Racine, Wisconsin, and Mattoon, Illinois, announces the issuance of Catalog No. 1349 covering its complete line of Jacket Water Coolers for gas, gasoline, and diesel engine cooling.

This catalog, complete with illustrations of typical installations, presents in detail specifications and ratings of the entire line, including the larger capacity Master Series—12 models capable of dissipating from 505,000 to 2,270,000 Btu per hr in water cooling service under standard conditions. The Standard Series—also consisting of 12 models—handles from 151,000 to 490,000 Btu per hr under the same conditions of service. Model 25 is also cataloged. This is a compact, low-cost unit, which the manufacturer states has been especially designed for cooling the jacket water of gas and diesel pumping engines of about 40 hp.

Catalog No. 1349 also illustrates and describes the complete line of Young Jacket Water Cooler Accessories including details on the three types of cores available—for water, oil, or gas cooling.

Young Radiator Company is well known in the industry as Engineering Specialists and manufacturers of heat transfer products for over 20 years. Free copies of Jacket Water Cooler Catalog No. 1349 will be sent upon written request to the company at its general offices, Racine, Wisconsin.

New Tasks For Giant Engine Lathes

One-half of a crankshaft for a 10 cylinder diesel.

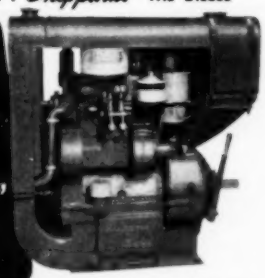
HIGH production of diesel engines required in the struggle to balance power generation capacity with rising electrical load is bringing new tasks to giant engine lathes.

Here on a lathe at Nordberg Mfg. Co., Milwaukee, is one-half of a crankshaft for a ten-cylinder diesel engine. This giant stationary diesel has a 29 in. bore, 40 in. stroke, and a rating of 7,100 HP. This five throw crankshaft section on the Mackintosh-Hemphill lathe is a single forging about 23½ ft. long and weighing about 22 tons.

The 84 in. by 50 ft. lathe is being used for turning the journal bearings and crankshaft cheeks. Lathe carriages are fed longitudinally by a heavy feed screw mounted on the bed between front and middle ways. Carriage cross feed is obtained from a lead screw mounted on front of the bed. A 75 HP motor is used to drive the headstock.

DIESEL'S THE POWER . . . *Sheppard's* THE DIESEL

PUT NEW "Muscle" into "weary" equipment



- 33 H.P. two cylinder power unit. Delivered ready for work.
- Efficient full-diesel operation on any one of 15 different fuels.
- Simplified fuel injection. No complicated assemblies.
- Available as 2,000 to 36,000 watt generating set for night lighting or auxiliary use.

Put your equipment back on a *paying* basis with Sheppard Diesel power. Keep it on the job 3 to 5 times longer between engine overhauls. Handle only half as much fuel . . . save up to 75% on fuel costs! Send for FREE Sheppard booklet that shows how to put new life into your "tired" machines.

DEALERS—There's a big market for 3.5 to 100 H.P. Diesels. Investigate a profitable Sheppard franchise.

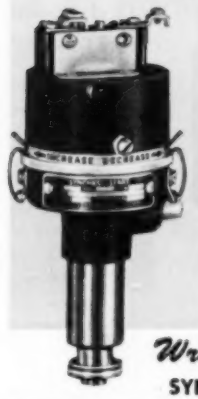
SHEPPARD DIESELS, HANOVER 8, PA.

Sheppard

STATIONARY AND AUTOMOTIVE **DIESELS**

OVERSPEED GOVERNORS

TO SHUT DOWN AN ENGINE AT A PREDETERMINED R.P.M.



SYNCHRO-START Governors are provided with adjustment for increasing or decreasing the shut-down speed while engine is running.

They are made to standard SAE dimensions of a battery ignition distributor. They may be mounted in a distributor take-off or may be driven by some rotating shaft on the engine thru a standard SAE coupling or gear. Governors can also be furnished with Angle Drive Attachment for belt, chain or gear drive or Governor Head can be supplied for use with any specialty designed shaft or casting.

Write FOR THE NEW SYNCHRO-START CATALOG

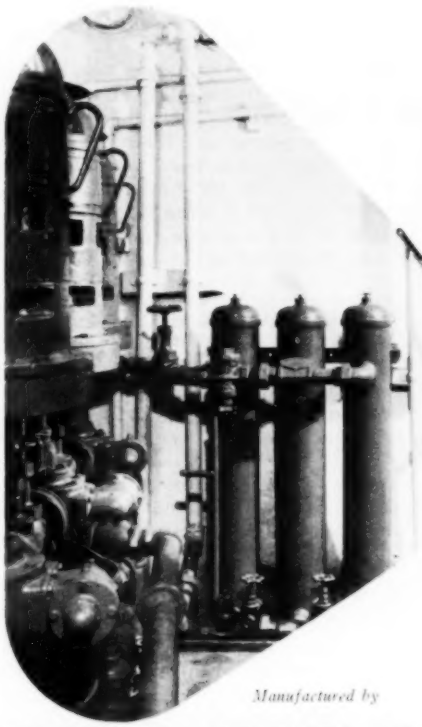
SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

1046 W. FULLERTON AVE., CHICAGO 14, ILL.

Phone Bittersweet 8-3511

ENGINE LIFE FUEL FILTERS PROTECT THE 2100 HP. DIESEL POWER PLANT IN THE WORLD'S LARGEST TUNA CLIPPER "MARY E. PETRICH"



"ENGINE LIFE" Fuel Filter Model C.F. 436, Type 300 D Triple Unit, cleans and dewaters fuel oil for the Diesel Engines on the "MARY E. PETRICH".

"MARY E. PETRICH" Designed, Constructed & Owned by the Petrich Family of Tacoma, Washington, this latest and largest vessel from Western Boatbuilding Corporation packs 450 tons of frozen Tuna at a top speed of 14 knots, and packs 2100 hp. of Diesel in her big engine room.

"ENGINE LIFE" Filters protect many of the largest and most successful fishing vessels on the Pacific Coast.

"ENGINE LIFE" replaceable elements also furnished for all Lube Oil filters on the "MARY E. PETRICH"

Manufactured by

ENGINE LIFE PRODUCTS CO., INC.

115 South Granada Ave.
El Monte, California

Sold and Serviced in the Pacific Northwest by

OIL FILTER SERVICE CO.

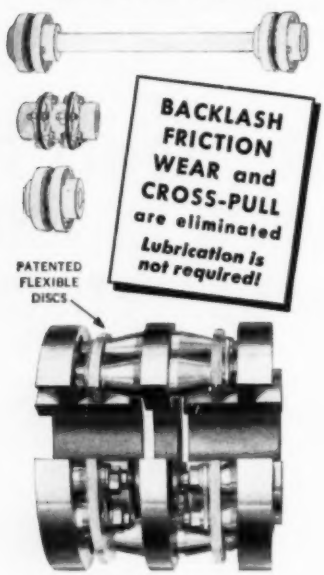
1216 So. Tacoma Ave. MAIN 1154 Tacoma, Wash.
Sales & Service In The Pacific Northwest, Western Canada, Alaska

THOMAS
Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.
NO MAINTENANCE PROBLEMS.
ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

National Supply to Furnish Six Diesels to New York Department of Public Works

MOST U. S. cities bordering a harbor or river area have a major problem to contend with in sewage disposal. But New York City's sewage problem is more than a major one. It is one that has reached staggering proportions, for into the New York harbor area—one of the nation's finest—pours an estimated 1,000,000,000 gallons of sewage every day of the year. As a result, some of the city's fine, world-famous beaches are unfit for swimming because of contamination.

The city has arbitrarily given itself ten years to clean up this problem, and at Owl's Head Point in Brooklyn, strategically located in the center of a critical contaminated area, municipal authorities have announced that building will proceed on the newest and largest of the city's modern sewage plants, the Owl's Head Sewage Treatment Works.

Right now, only foundation piles indicate that anything big is brewing at Owl's Head Point off Shore Parkway at the northern end of The Narrows. But yesterday, the scope of the New York program received a strong underscore when The National Supply Company, of Pittsburgh, announced that six of its "Superior" diesel engines had been purchased by the New York Department of Public Works to provide power for the new sewage plant which, when completed, will treat about 160,000,000 gallons of sewage per day.

These National Supply diesel engines are designed to run on a "dual fuel" principle in which either gas, oil, or both may be used. In this case, a striking economy will be effected in that sewage gas itself will be utilized as fuel.

New York believes it is the first city to develop a sewage plant powered by dual fuel engines. The engines at Owl's Head will drive 900 kw, 60 cycle, 4160 volt alternating current generators with direct connected exciters. Each of the 8-cylinder engines will produce 1300 horsepower for this particular application.

The National Supply Company is one of the nation's major producers and distributors of oil field machinery and equipment, and recently, the firm's "Superior" diesels figured in a world's record established when Superior Oil Company sank a wildcat well nearly four miles into the earth near Rock Springs, Wyoming—the deepest well ever drilled anywhere. However, National Supply's diesels are being widely utilized to power many major public works developments and projects as well.

Through an integrated sewage disposal plant system in which five plants are already in operation all of New York's 52 district beaches will some day be free of the contamination that has given the project a top priority on the list of the city's civic undertakings. At the present time, one authority has stated, only 13 beaches in the entire area are sufficiently free of sewage bacteria to be pronounced suitable for bathing.

Coast to Coast Representation for Synchro-Start

COMPLETED arrangements with the H. C. Ribble Company in the eastern territory fulfills coast to coast representation for Synchro-Start Products, Inc. The C. H. Ribble Co. has offices in New York, Boston, and Philadelphia and covers all of New England, New York, Eastern Pennsylvania and the coast area down as far as Washington, D. C.

Synchro-Start is also represented by R. T. Puelicher in the California, Utah, Nevada, Arizona and New Mexico territory, by J. B. Hickman in the Seattle area, and by the Industrial Equipment Company, of Houston, in the Texas Gulf area.

New Head for Allis Chalmers Research

J. F. FITZSIMMONS has been named manager of Allis-Chalmers commercial research department effective August 1, succeeding J. R. Reed, who has resigned to establish his own business, according to J. L. Singleton, vice president and director of sales of the company's general machinery division.

Fitzsimmons, a graduate of the University of Wisconsin, has been associated with Allis-Chalmers since 1943. He became supervisor of the department's market research section in 1946. He is a member of the American Statistical Association, the American Economic Association, the American Marketing Association, and has served as president of the Milwaukee chapter of the latter group.

New President of Foreign Trade Club of Detroit

RICHARD G. HANNA, General Sales Manager of the Gray Marine Motor Company, has been elected President of the Foreign Trade Club of Detroit, an organization prominent in the automotive and industrial field. Mr. Hanna is a member of the World Affairs Committee of the Detroit Board of Commerce and a member of the International Affairs Committee of the Detroit Economic Club.

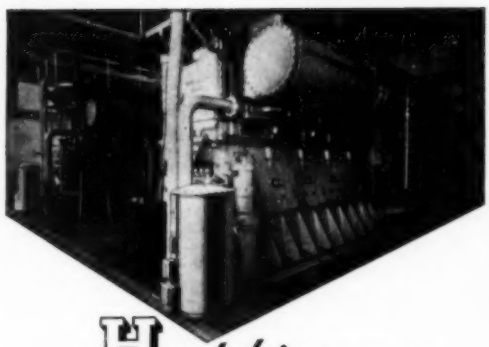
National Motor Boat Show in January Will be 40th

GEORGE W. CODRINGTON, President of the National Association of Engine and Boat Manufacturers, has announced that the 1950 National Motor Boat Show will open in New York at Grand Central Palace, on Friday evening, January 6. With the exception of Sunday, January 8, the show will extend through a nine day run, closing Saturday evening, January 14.

New Silencing Systems

THE Shawmac Silencing Corporation of New York claims considerable success with its new type silencers. It is stated that not only is exhaust noise reduced to a minimum, but back pressure reduced and exhaust temperature appreciably lowered.

Diesel Engine Catalog is just off the press in its Fourteenth Edition. See the unique Diesel Horsepower Range Chart — invaluable aid to design engineers and buyers. ORDER COUPON ON PAGE 69.



Hutchinson gets DEPENDABLE OIL PURIFICATION

ON ALL SIX DIESELS at the Municipal Light & Power Plant, Hutchinson, Minnesota, Honan-Crane equipment delivers dependable oil purification.

Superintendent R. E. Young uses Honan-Crane purifiers on three 625 hp McIntosh-Seymours, two 3060 hp Busch-Sulzers, and one 1500 hp Nordberg, and maintains a fine record of continuous engine performance.

Let Honan-Crane engineers tell you about full purification of diesel fuel and lube oils at low cost. Write to Honan-Crane Corp., a subsidiary of Houdaille-Hershey Corp., at Lebanon, Ind.

CL[illegible] OIL ENGINEERING

JUST OUT! Your guide to better air and oil filtration! FREE!

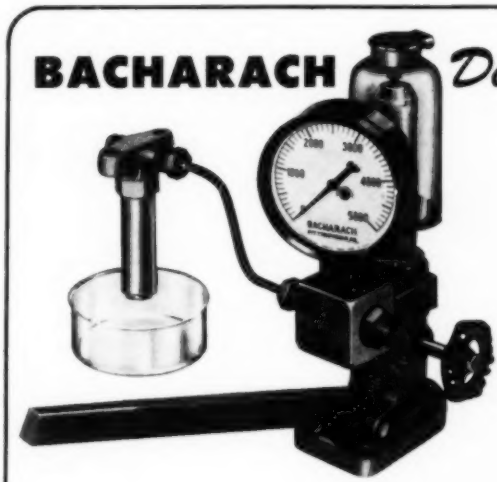
This new Air-Maze catalogue gives you information you should have about the latest developments in air and liquid filtration. Whether you build or use engines, compressors, air conditioning and ventilating equipment, or any device using air or liquids, you'll want to have this handy guide at your finger tips. Send for your free copy today!

INCLUDES PICTURES AND INFORMATION OF THE FOLLOWING AIR-MAZE PRODUCTS:

- Air filter panels and water eliminators
- Oil bath air filters
- Electromaze electric air filter
- Unimaze and Multimaze oil wetted air filters
- Air intake silencers and filter silencers
- Back fire flame arresters and tank vent arresters
- Breather filters
- Oil and fuel filters
- Oil separators, screen type
- Oil separators, electrostatic type
- Exhaust spark arresters
- Pipeline filters

AIR-MAZE CORPORATION, CLEVELAND 5, OHIO

BACHARACH *Diesel* NOZZLE TESTER



This nozzle tester is manufactured with the tools and under the patent rights formerly owned by Aircraft & Diesel Equipment Corp. It is identical to the ADECO Nozzle Tester Model PH-25.

We can make immediate delivery of complete units, as well as of all spare and replacement parts for ADECO Testers now in use. We also will service and repair promptly all Nozzle Testers previously sold by Aircraft & Diesel Equipment Corp.

A wide selection of nozzle connectors and fixtures is available for making every recommended service test on all makes, types and sizes of Diesel nozzles and injector units.

For further information fill in and return coupon today.

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa.

Send me literature checked:

- ☐ **Product Leaflet 613 on Bacharach Nozzle Tester.**
- ☐ **Technical Bulletin on testing and servicing fuel injectors.**

Name_____

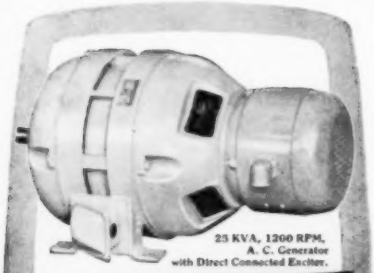
Company_____

Street_____

City and State_____

BACHARACH INDUSTRIAL INSTRUMENT CO.

7000 BENNETT STREET · PITTSBURGH 8, PA.



COLUMBIA
GENERATORS
A.C. and D.C.

Columbia, with its years of experience, brings to you a wide line of performance proved, sturdily built, A.C. and D.C. Generators. **A.C. Generators: 6¼ to 375 KVA. D.C. Generators and Exciters: 2 to 200 KW.** Available in Single or Two Bearing Construction. *Write today for information. Our engineers will be glad to review your requirements. Prompt delivery.*

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., Cleveland 14, Ohio

Are You Having
INJECTOR TROUBLE?

Believe it or not, you'll smile again after you install a

SUN DIESEL FUEL FILTER

Your injector troubles will likely vanish like magic just as soon as that constant flow of clean fuel reaches your Diesel Engine!

That's because Sun-Diesel Fuel Filters not only provide a clean fuel—they preheat the fuel for greater efficiency. So, why not end injector troubles NOW . . . with a Sun Diesel Fuel Filter!

Also manufacturer of Sun Dual Flow and Sun Regular Flow Oil Filters

Sold through supply stores only

SUN ENGINEERING COMPANY
P. O. BOX 4404 - OKLAHOMA CITY 9, OKLA. - PHONE 6-1447

District Manager for National Supply

W. M. Griffith

W. M. GRIFFITH has been named district manager of the southern area, Pacific Coast territory, of the Superior Engine Division of the National Supply Company. The announcement was made by Robert M. Pearson, manager of sales of the Superior Engine Division, which manufactures diesel engines at the Springfield, Ohio, plant of National Supply. With Griffith's appointment, the diesel engine manufacturer has established the second of two West Coast sales offices. The other is located at Portland, Oregon, with northern coastal region sales in charge of Louis R. Shults.

Mr. Griffith's headquarters will be maintained at the Torrance, Cal., plant of National Supply, where Pacific Coast activities of the Superior Engine Division are directed by Lewis L. Livesley. Before joining the Superior Engine Division staff, Mr. Griffith had served as sales head for Atlas-Imperial Diesel Engine Co. of San Francisco.

Prize-Winning Advertisements

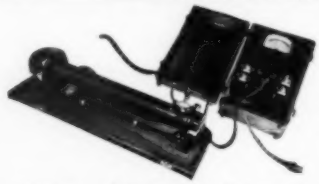
THE Standard Oil Company of California has won a prize conducted by the Industrial Advertisers Association. Basis for the award was "For the campaign which in the opinion of the Judges is of outstanding excellence in its planning and execution." This was the first competition in which Standard Oil of California advertising had been entered and the combination of the advertisements and media used has brought them outstanding results.

Railroads Absorb Diesel Production

DESPITE rumors of an economic lag in general business conditions, American railroads are absorbing the production of manufacturers of Diesel locomotives. *These pictures show the daily output of one of these manufacturers—Electro-Motive Division of General Motors Corporation.*

In the "Passenger Train Car Miles" column of the April, 1949, I.C.C. report, Diesel-powered equipment rolled up figures surpassing all forms of steam-powered equipment. Likewise Diesels have similarly shown great advances in the field of freight traffic and switching services. Through high availability and low operating costs Diesels are helping railroads to meet changing economic situations.

CRC SMOKEMETER



Objective photoelectric indication of smoke density, independently of human judgment and of atmospheric conditions.

Approved by Coordinating Research Council.

Manufactured by
PHOTOVOLT CORP.
95 Madison Ave. New York 16, N. Y.
Write for Literature

SILENCING SYSTEMS

for MARINE INDUSTRIAL and AUTOMOTIVE engines

Designed by F. S. McLachlan

Complete engineering service on Silencing Problems. Consult us, whatever your make of engine. Specially engineered for each application. Marine underwater silencers.

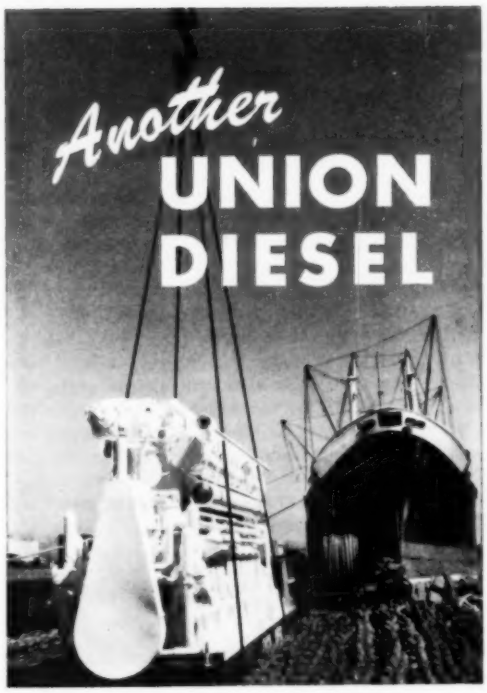
SHAWMAC SILENCING CORP.
ROOM 913 110 E. 42nd ST. NEW YORK 17

NEW PETROMETER
FOR ALL TANKS
FOR ALL LIQUIDS
FOR ALL DEPTHS
FOR ALL DISTANCES
PETROMETER CORPORATION
5 STAR SQUARE LONG ISLAND CITY 1, N.Y.

Practical...
THOROUGH TRAINING
to provide YOU with
COMPETENT DIESEL MECHANICS AND OPERATORS

Hemphill Home-Study Training also available for up-grading industry personnel, or for those preparing to enter the Diesel industry, but who are unable to attend our resident school.

Hemphill Diesel & Automotive Schools
department of West Coast University
1601 South Western Ave., Los Angeles 6, California



SPECIFY THIS
COMPACT TUTHILL PUMP

For Dependable High Pressure Service

This Tuthill Model C K pump is designed to save space, material and money in high pressure service on machine tools, engines and hydraulic devices. Available in capacities up to 50 g.p.m. and pressures up to 400 p.s.i. Direct motor drive, V-belt units and integral drives. Write for Model C K bulletin.

TUTHILL PUMP COMPANY
939 E. 95th Street, Chicago 19, Ill., Phone REgent 4-7420

DIESEL USERS!

Here's how FRAM FILTERS can save you money . . .

Read these excerpts from the letter of a Fram user:

BARTON MINES CORPORATION
NORTH CREEK, N. Y.

July 6, 1948

Fram Corporation
Providence 16, R. I.

"We have installed Fram Filter units on three of our Diesel engines... running in an exceedingly dusty location.
"We have cut lubricating oil consumption over one-half...greatly increased time between overhaul periods ...the liner, ring and bearing wear is a great deal less...
"We are now erecting a new power plant ...installing Fram Filters on this unit.
"Our detergent type oil is still clear after maximum use...we have minimized hard carbon formation...
"We honestly recommend these Filters ...paid for themselves in less than 6 months."

Yours very truly,
BARTON MINES CORPORATION
H. H. Vogel, Vice Pres.

FRAM Can Help You!

No matter what your Diesel oil filtering problem—fuel or lube—Fram can help you conquer it. Let Fram's Research Department help you by determining what Fram Filcron Oil Filter you need for keeping injectors clean and efficient... keeping vital moving parts free from the damage caused by dirt, dust, grit, sludge and abrasives.

Save money, time on overhauls, breakdowns, the Fram Filcron way. Write today to Fram Corporation, Providence 16, R. I. *In Canada:* J. C. Adams Co., Ltd., Toronto, Ontario.

FRAM
Filcron
THE MODERN OIL FILTER

Complete Dieselization on IHB

THE New York Central Railroad announced today the award of an order for 72 more diesel-electric switching locomotives to enable completion of dieselization of the Indiana Harbor Belt Railroad, a key Central affiliate in the busy Chicago industrial area.

The newly ordered locomotives, which are of 1000 hp. each and will cost a total of approximately $2,616,000, will be manufactured by General Motor's Electro-Motive Division at its Cleveland plant.

This brings to 79 the total of diesel-electrics on order for the Indiana Belt. With completion of delivery scheduled for 1950, the then fully-dieselized IHB will have 118 diesels in service, compared with 39 at present.

Changes in Hallett Management

AUSTIN SHERMAN, President of the Hallett Manufacturing Company of Inglewood, California, has announced the election of William D. Brumbach as Vice President in Charge of Sales; W. W. Schrein, Secretary Treasurer; and V. C. Capfer, Manager of Service. The new management board are all seasoned "Hallett Manufacturing" men who are veterans in the domestic and foreign marketing fields. Mr. Sherman stated that the new Hallett Models AC1, 5 hp Air-Cooled, and D2BC 18 hp Water-cooled engines are now in production, and are manufactured to the same high standards of quality and engineering as the Hallett Models D1A and D2 diesel engines for both domestic and foreign fields. William D. Brumbach, Manager of Sales, stated that he feels these new Hallett engines will open new markets here and abroad and broaden the scope of Hallett sales throughout their distributorship organization around the world.

Death of E. J. Burnell, Link-Belt Vice-President

Edward J. Burnell

MR. EDWARD J. Burnell, vice-president and general sales manager, and director of Link-Belt Company, died at his home in Winnetka, Ill., on Friday, July 22, after an illness of several months.

Mr. Burnell was born in Tondu, Wales, Great Britain, April 7, 1888. He came to this country with his family and lived in Catasauqua, Pa., where he is being buried. He was graduated from Lehigh University in 1910.

Mr. Burnell served Link-Belt Company in many important capacities, in engineering, sales and plant management. He was a director of the American Mining Congress, Drexel State Bank of Chicago, Foundry Equipment Manufacturers Association, the Conveyor Equipment Manufacturers Association, and the YMCA of Hyde Park (Chicago).

During the war he served on the advisory boards of Machinery Branch of War Production Board and the Chemical Corps of the War Department, and as Consultant to the Reconstruction Finance Corporation.

New Booklet Tells How to Specify and Buy Alloy Steel

"HOW To Specify and Buy Alloy Steel with Confidence," is the title of a new 24-page booklet just published by Joseph T. Ryerson & Son, Inc., steel distributors.

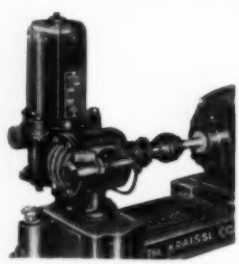
In the foreword, it is pointed out that because alloy steels must be heat treated to attain their full strength, there are a number of control steps which should be taken if alloys are to be purchased and used with complete confidence that they will give the service required. The booklet then covers these control steps one by one, outlining in detail the safest methods of specifying and buying so that the user may be protected against the possibility of, 1) getting the wrong alloy, 2) errors in heat treating, 3) costly breakdowns resulting from using the wrong alloy or failure to properly heat treat the right alloy.

KRAISSL
ROTARY AIR PUMPS

FOR VACUUM AND PRESSURE

Designed for high efficiency—for the packaging and printing machine fields. Rigorous on-job tests prove Kraissl pumps are the economy answer to your vacuum and air-under-pressure problems. Exclusive Kraissl design gives maximum performance—and lower costs. Compact and lightweight—with exceptionally large capacities for size; force-feed lubrication system assures continuous heavy-duty service.

- Run at direct motor speeds—but not limited to motor operations
- Integrated oil-air filter available
- Force-feed lubrication system
- Compact and lightweight
- High capacities



FREE—Write for our Bulletin A-1209 today. If you have any special problems—if you need any detailed information—please write us fully. You will receive a prompt and detailed reply.

KRAISSL CO., 307 Williams Ave., Hackensack, N. J.
Please send me Bulletin A-1209 on your Class 25 pumps.

Name

Company

Address

KRAISSL THE KRAISSL COMPANY, Inc.
HACKENSACK, N. J.

Save 18½ Man-hours Cleaning Diesel Engine Parts

Former Cleaning Time	20	Man-hrs.	
Magnus Aja-Dip Method	1½	"	"
Time saved	18½	"	"

You, too, can save 15 to 20 man-hours on your diesel engine parts cleaning when you *stop using a soak tank and hours of manual scrubbing and scraping.*

Let automatic, mechanical agitation do the work — in less time — with much less labor — at lower cost! Write today for complete information on the Magnus Aja-Dip Method.

Ask for Bulletin 407-AST
EQUIPMENT DIVISION

MAGNUS CHEMICAL CO., Inc.
85 South Avenue
Garwood, N. J.

MAGNUS AJA-DIP DIESEL CLEANING

NEED TRAINED DIESEL MEN?

Hemphill graduates have received broad, practical training in the operation, maintenance, and servicing of diesel engines.

On your job they can save you money, and make you money.

GET THE KIND OF DIESEL MEN YOU NEED FROM

HEMPHILL SCHOOLS, INC.

New York
31-28 Queens Blvd.
Long Island City 1, N. Y.

Memphis
311 South Main St.
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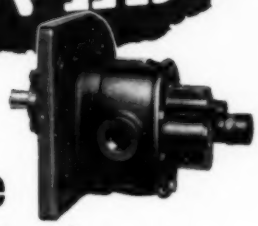

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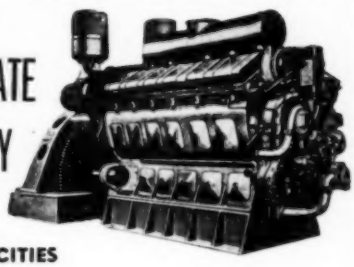

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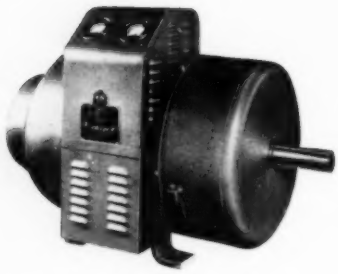
For full information on low cost purification of diesel fuel and lube oils, write to Honan-Crane Corp., 202 Indianapolis Ave., Lebanon, Ind., a subsidiary of Houdaille-Hershey Corp.



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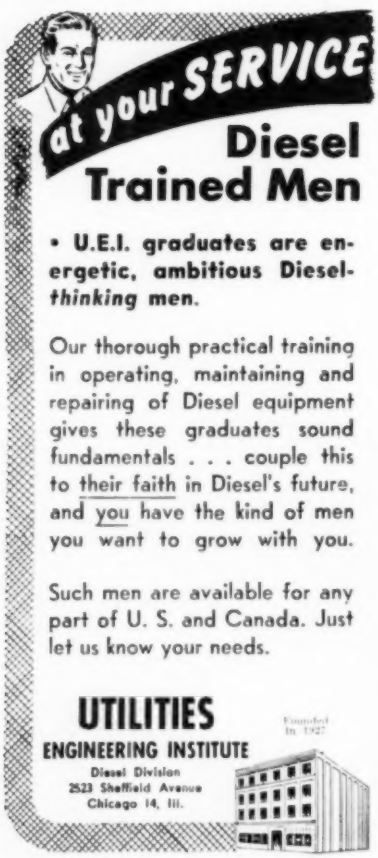
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WEST COAST DIESEL NEWS

By FRED M. BURT

RE-POWERED with an Atlas Imperial Diesel engine, Model 6 EM-253, 6-cyl. 135-hp @ 400 rpm, also with new 2:1 Snow-Nabstedt reduction gears, the yacht VAGABUNDO, a 60′ motor sailer, owner Louis Cass, Los Angeles. Equipment from Atlas Marine Supply Co., San Pedro.

POWERED with a 115-hp Caterpillar diesel with 2:1 Western reduction gear, noteworthy for her speed is Alaska limit seiner SIERRA MADRE from the Harold Hanson yard, Seattle, owned by Nick Vojkovich and Bob Sebastian.

FOR extension of Los Angeles-Oklahoma City trucking service to Chicago, Transcon Lines have purchased eight more Kenworth tractors with 150-hp HB Cummins diesel engines. These cab-over-engine units are "Denver Specials" to conform to short length limit laws.

AFTER test periods in California and Arizona areas, of four units with General Motors diesels, Anderson-O'Brien "De-Alkizers" have their first public showing at the Los Angeles Co. fair, Pomona, Sept. 16-Oct. 2. These units when used with an internal combustion engine, improve crop production by neutralizing alkalinity of irrigation water and of the soil.

ADDED to their large fleet of trucks, owned by Harbor Refining Co., Long Beach, two Autocar tank trucks powered with 275-hp Cummins Diesel engines, from Autocar Sales & Service Co., Los Angeles.

DURING complete rebuilding and modernization of clipper SEA BOY, Skipper Manuel Luis, at Martinolich Shipbuilding Yard, San Diego, a new 400-hp Enterprise propulsion diesel was installed.

BUILT by Tacoma Boat Building Co., for Svornich brothers, Matt, Romale (skipper), and Dominick—new 57′ purse seiner STAR OF THE SEA is powered with a 171-hp Buda diesel, also with Willard batteries.

TO AUGMENT equipment for a big road relocation job at Portland, Oregon, Guy F. Atkinson Co., has procured ten new Euclid trucks powered with NHBS, 275-hp Cummins diesels.

A NEW addition to Libby, McNeil & Libby cannery craft, 90′ steel power scow, SUNNYVALE, built by Weldit Tank & Boiler Wks. Bellingham, Wash., designed by H. C. Hanson, Seattle; is powered with two 120-hp Caterpillar diesels with 2:1 reduction gears supplied by N. C. Marine, Seattle.

POWERED with a 6-cyl. 225-hp G.M. diesel from Shoreline Diesel Maintenance, San Francisco, a new 36′ combination boat built at Genoa Boat Works, Fisherman's Wharf, S.F., for Antonio T. Ghio, Santa Cruz, Calif.

THE 110′ tuna clipper CONSTITUTION, for Skipper Paul Lynn, under construction at Martinac Shipbuilding yards, Tacoma, will be powered with a Model 60N8, 615-hp, Superior direct reversing, marine diesel.

FOR heavy re-powering of tugboat GLORIA COLLE, Colle Towing Co., New Orleans, an Enterprise Turbocharged Model DMQ-36, Diesel engine, rated 1,000-hp at 300-rpm, a lot of power for a vessel only 92′ long, with 21′ 6″ beam.

WITH MAIN engine an 8-cyl. Fairbanks-Morse 500-hp diesel, auxiliaries twin 30-KW GM diesel sets, the JOHN N. COBB, 93′ North Pacific exploratory fishing vessel of U. S. Fish and Wildlife Service, is under construction by Western Boat Bldg. Co., Tacoma, under low bid of $215,400.

ENLARGED shrimp-freezing (20 up to 25 tons daily) capacities at the large plant of Pesquera de Topolobampo, 300 miles south of Guaymas, Mexico, designed and supplied by Ralph E. Manns Co., Wilmington, Calif., has added power supplied by new 300-hp, 6-cyl. Fairbanks-Morse diesel driving 225-KW generator. For other refrigeration also purchased, an 80-hp. and a 190-hp. Atlas Imperial diesels.

CONVERTED from a YMS, the 136′ MICHELLE EVE equipped for shark fishing in southern waters, carrying 20,000 gal. fuel oil, is driven by twin 500-hp G.M. diesels, with Hercules and Cummins diesel auxiliaries.

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Fulton Diesel 1000 H.P. 225 R.P.M. 4 Cycle 8 Cylinders
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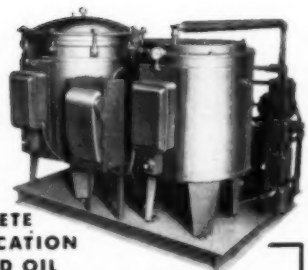

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FOR HIGH-SPEED shuttle trucking over the Ridge route, Los Angeles-Bakersfield, two round trips each 24 hrs., two more C.O.E. Kenworth tractors, 14' over-all length, for 48' loading space under length limits; powered with HRBS 6-cyl. 225-hp, Cummins diesels. Units built to design of Lennon Duntley of purchasers, Pacific Freight Lines of Los Angeles.

A NEW diesel engine cooling system from Engineering Controls, Inc., Los Angeles, is connected from convenient location, to engine with two pipes. The single, packaged unit (four sizes 65-hp to 200-hp, others available) combines Vapor Phase unit with a steam turbine, fan and condenser, operating on low pressure steam from Vapor Phase unit; turbine runs cooling fan at 1150-rpm at 5 lbs. steam, to 2150-rpm with 15 lbs. Cooling maintains balance with heating, and continues after engine shut-down.

Bulletin on Packaged Power Supply

THE International Diesel-Electric Company of Long Island City, is offering their new bulletin on complete packaged power. This four-page folder describes International Diesel Electric's diesel generator sets designed for emergency or continuous service. These sets range in capacity from 5 kw. to 250 kw., and are illustrated by photographs showing ten typical units to demonstrate the scope and application of these power plants.

Elliott Company Acquires Crocker-Wheeler

THE acquisition, by Elliott Company, as of September 16, of the business and assets of the Crocker-Wheeler Div. of Joshua Hendy Corp. has been announced by Grant B. Shipley, Chairman of the Board of the Elliott Company, Jeannette, Pa.

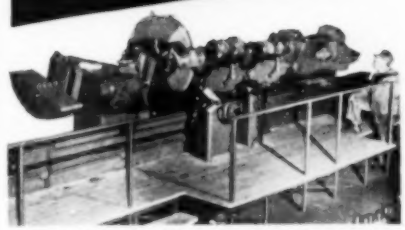
Elliott Company, whose president is W. A. Elliott, was organized in 1901 and is now a leading builder of steam, power and electric equipment for process plants. Elliott plants are located at Jeannette, Pa., Ridgway, Pa., Springfield, Ohio, and Newark, N. J.

With the addition of the Crocker-Wheeler Division, Elliott Company now has a complete line of a-c and d-c motors ranging in size from one horsepower up to 25,000 horsepower. Formerly the Elliott Company line of equipment did not include motors under 200 horsepower.

Crocker-Wheeler is one of the oldest manufacturers of motors and generators. It dates back to the C & C Electric Motor Co., founded in New York City in 1885. The Crocker-Wheeler Electric Motor Company was organized in 1888 and incorporated the following year. In 1893 operations were moved to the site in Ampere, N. J. where the plant is presently located. The company has a well-earned reputation as one of the important pioneer manufacturers of electrical machinery.

The Crocker-Wheeler Div. of Elliott Company will continue to operate under its previous management with Charles A. Butcher as general manager. Mr. Butcher has also been elected a vice president of Elliott Company.

CRANKSHAFT GRINDING SERVICE



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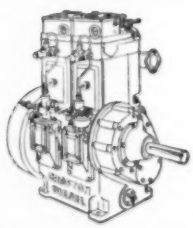

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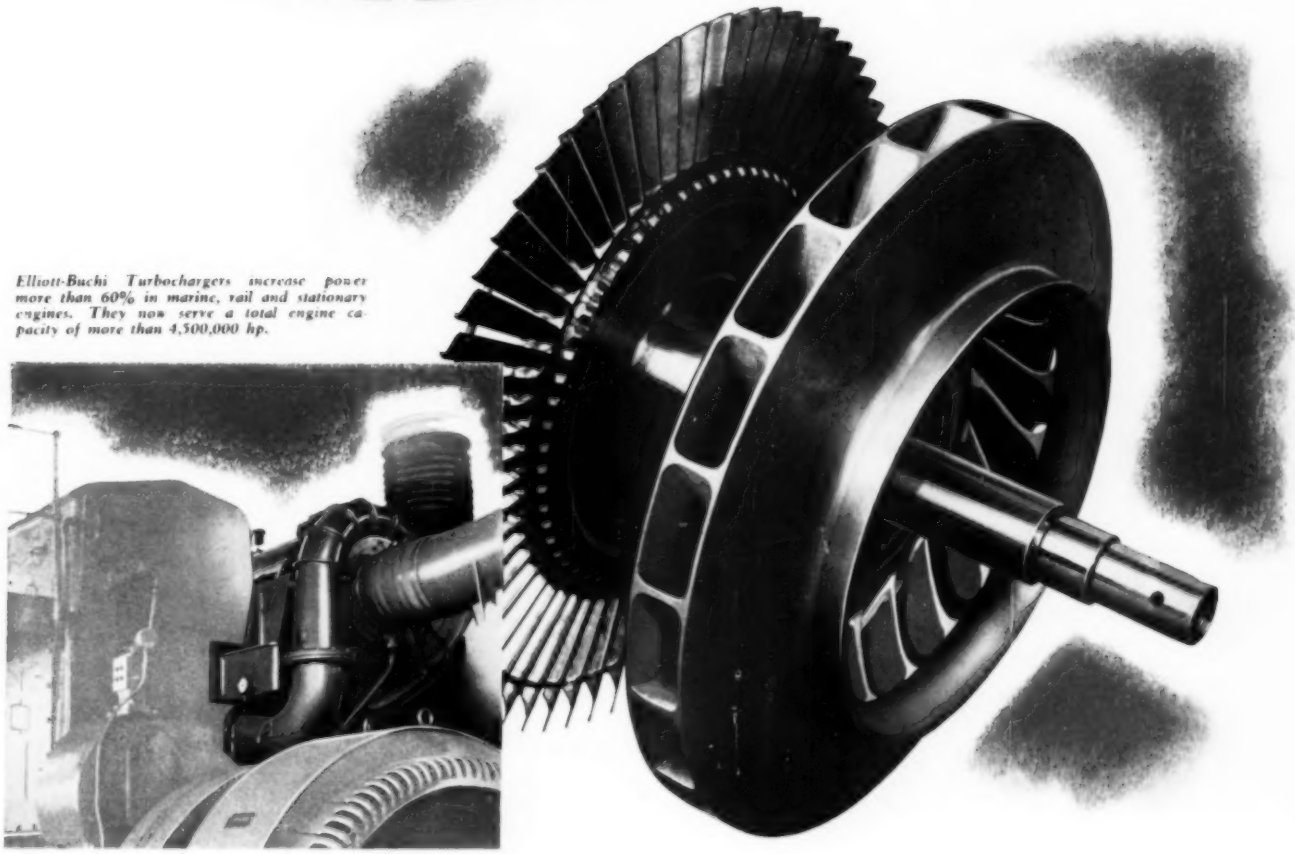

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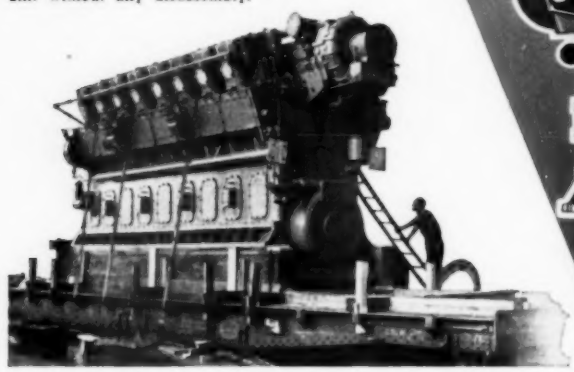
RIGHT: cross-section of Cooper-Bessemer LSV diesel (15½" bore, 22" stroke) showing rugged, compact design and articulated connecting rods. Features include, large 13⅛" diameter counterbalanced crankshaft, unusually low bearing pressures, and exceptionally low head room.

BELOW: Cooper-Bessemer 16-cylinder LSV engine, rated 3,400 hp at 327 rpm, mounted on flat car ready for shipment. As shown, complete factory-tested engine can be shipped as a unit without any disassembly.



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